

Contractors and Engineers Monthly

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PICKS and SHOVELS

By O. E. POTTER

GOOD roads have become so much a part of every day life that little thought of their contribution to our progress and daily comfort is given to them as we drive along over the smooth stretches of gleaming white concrete, or the equally smooth stretches of shiny black asphalt. Only when the opportunity to ride over less satisfactory highways comes to us, is it impressed upon us what "good roads" really mean.

Where Ruts Are Roads

Not long ago it was my privilege to visit one of those sunny and verdant isles in the Caribbean, among the charms of which even moderately good roads are conspicuous by their absence. A drive out into the country proved to be one of the most hair-raising experiences it has been my questionable privilege to enjoy. After bouncing and jouncing over ruts, stones and bumps in a cloud of dust from the unmaintained dirt road, we left what was quaintly termed "the good road" and proceeded through a series of mud holes, ruts a foot or two deep, down steep embankments and across streams 4 to 6 feet below the road level, the crossing of which was made possible only by the stamina of an American-made car and the efficiency of a native driver whose wizardry at the wheel was close to a miracle. Between silent but agonized questionings as to the possibility of getting through such an experience alive, or at least intact, my thoughts could not help reverting to the roads of the United States which heretofore had been accepted as a matter of course—not as a cause for general thanksgiving.

Slow-Motion Road Repair

In one small town, we came across a road gang, from the local gendarmerie by the way, repairing one of the main roads of the town, which explained, in some measure, the reason for those

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A Four-Year Record of Employment in Road Building

Reduced Federal Road Funds Makes States Responsible for Future Highway Program

By THOS. H. MACDONALD
Chief, U. S. Bureau of Public Roads

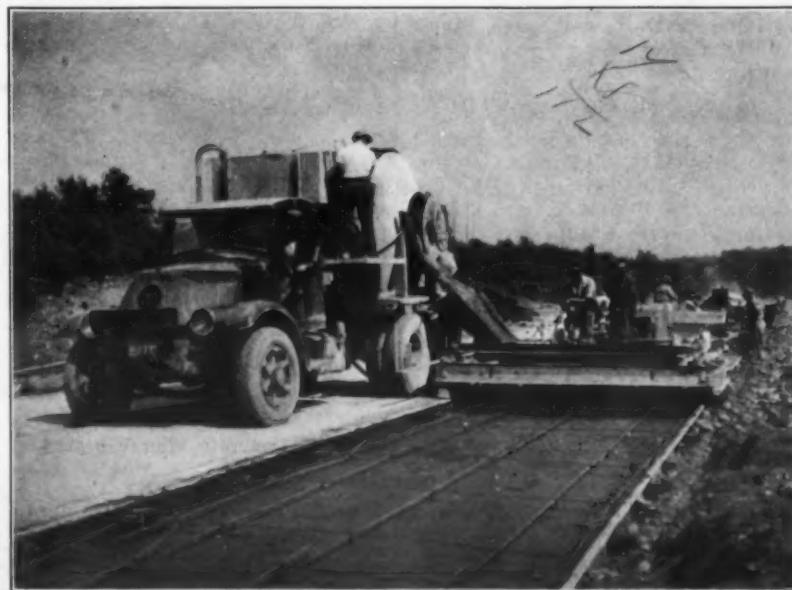
CONGRESSIONAL effort to increase employment through road work began as early as April, 1930—less than six months after the stock market collapse. The action then taken, which may be regarded as the first direct attack upon the depression by the Federal Government, provided for an increase in the Federal-Aid road apportionment for the fiscal year beginning July 1, 1930, from the \$75,000,000 already authorized to \$125,000,000.

For six years previously the Federal contribution had stood at the \$75,000,000 figure, and throughout that period had represented a very small part—from an eighth to a sixth—of the combined State and Federal expenditure for the construction of highways within the various states.

The additional \$50,000,000 that was voted not only for the fiscal year ending June 30, 1931 but also for the two succeeding years, it was thought would add somewhat to the employment provided on road work and so contribute in a measure to the quick economic revival that was then expected. Since the State contributions had so greatly exceeded the Federal there was no thought at first that any State might find it difficult to match the enlarged Federal offer. Yet that, it was shortly discovered, was the condition which confronted a large number of States.

(Continued on page 13) N. A.

TEN-WHEEL TRUCK-MIXERS WORKING IN BAY STATE



Concreting on Cambridge-Concord Highway Is Described on Page 8

MAR 2 1937

Crawler Wagons Used in Tight Quarters on Sky Line Drive

Forward to Washington for ARBA Convention

The Thirty-Second Annual Convention and Exhibit of the American Road Builders' Association will be held in Washington, D.C., January 22-25, 1935, at the Hotel Willard. The entire top floor will be given over to the exhibits of equipment and materials. The convention papers will review the highway program to date, and consider its future and the effects of proposed Federal legislation. Special sessions for contractors, county officials, city officials and the Pan American delegates will be devoted to their particular problems. The Road Builders' Banquet will climax the convention program on Thursday evening.

Big Machinery Show

Caterpillar Tractor Co., Peoria, Ill., will hold what promises to be the biggest machinery exhibit of 1935 in the display rooms of the company in Peoria, Ill., January 8-20. Over fifty manufacturers are participating and a half-million dollars worth of equipment, including construction, road building, agricultural, logging and oil-field machinery, will be on display. Any one interested is cordially invited to attend.

Sammons-Robertson Co. Push 10.25-Mile Section near Luray, Va.

(Photos on page 36)

SUCCESSIVE steps have been taken by the Federal government through the Bureau of Public Roads to provide a highway of unparalleled scenic beauty along the Blue Ridge mountains in Virginia. Already a section extending from U.S. 211 near Luray, Va., to Va. 4 near Elkton, Va., has been completed and opened to the public. Another section is under construction extending north from U.S. 211 toward Front Royal, Va.

Of the three links in the new section we shall confine our description to the contract of Sammons-Robertson Co., Inc., the middle portion of the work. Active work was started on June 27, 1934, on this 10.25-mile contract extending from Comptons Gap to Hogback Mountain. The contract date was July 14, 1934, from which time the contractor is allowed 300 working days for the completion of the work, with allowances for the time taken out by the engineers for cold weather.

Placing the Equipment on the Job

The Blue Ridge Mountains are rough terrain, as a study of any contour map of the country will show, and so it was not an easy matter to get the big shovels up into the right-of-way. The nearest freight unloading point was 5.7 miles from Brownsville which is at the base of the mountains at about Elev. 350 while the grade of the contract runs from Elev. 1,500 to 3,093. Other sections of the work farther north reach a maximum elevation of 4,000 feet. Fortunately for the contractor the CCC camp in this section had broken a fair trail 5 miles long from Brownsville up to the right-of-way near which the CCC camp was located. The grade was steep with some places where it reached 25 and 30 per cent. It was necessary first to strengthen some of the bridges on the trail and also to widen the trail and remove some large trees and boulders which were not in the way of ordinary light trucks using the trail but which obstructed the path of the large shovels which required more space to work their way up the grade.

It took three days to get the first shovel unloaded and up to the line of the job. The second required only two days, but the contractor took three days for the third shovel as it was a new machine and he did not want to push it too hard so early in the game. Also it was brought 1 1/2 miles around the line to open a large cut. The three shovels used were two Lorain 75B machines with

(Continued on page 12)

100 Yards of Concrete Average Pour Per Hour at Miss. River Bridge

FOLLOWING closely on the use of sand islands for sinking the deep river piers of the new Mississippi River Bridge at New Orleans, Siems-Helmers, Inc., the general contractor for the nine main bridge piers, brought in a complete floating mixing plant. This concreting outfit with its auxiliary tower and derrick poured the 25,000 cubic yards of concrete in each of the four main river piers at an average rate of 100 cubic yards an hour with a 1½-minute mix for each 2-yard batch.

The Siems-Helmers contract included the sinking of five caisson piers in the river, one land caisson pier and three pile foundation piers. River Pier No. 1 is typical of the deep river piers which formed the real problem of this job as the work was carried on in a maximum depth of 95 feet of water. The caisson for this pier was 65 x 102 feet and carried a distributing block of concrete 30 feet high which did not cover more than three quarters of the caisson but carried the load of the pier to the caisson equally by distributing it to the cross walls. The concrete substructure from Elev. —5 to +25 was faced with granite filled with a 5-inch slump concrete. The shaft extended from +25 to +145. Two American Revolver cranes with 100-foot booms capable of handling 10 tons at an 85-foot radius and equipped with 12 x 14 American engines having air control were so placed that they could reach every portion of the caisson and handled all the materials including concrete chutes, steel cylinder sections, caisson forms, reinforcing, granite block facing, etc.

The Barges

The steel barge on which the entire mixing plant is assembled is 40 feet beam, 125 feet long and has a draft of 9 feet, 6 inches. It is anchored in place for chuting concrete by four steel anchors with steel cables handled by four specially-built single-drum American steam hoists located at the four corners of the barge. These manipulate the mixer barge only, all placing of the aggregate and cement barges being handled by a tug of the Siems-Helmers fleet.

All sand and gravel was delivered by barge loads of 1,000 tons each. The material was brought from Franklinton, La., by rail a distance of about 140 miles, loaded into the barges and towed about 5 miles upstream to the site of the bridge. The Lone Star portland cement

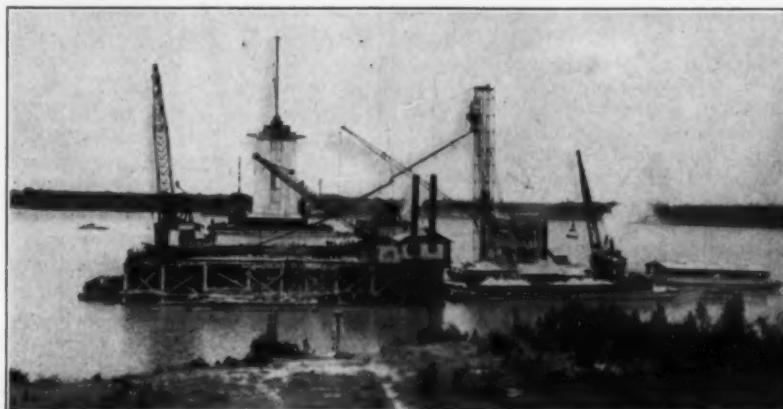
Floating Concrete Plant Used by Siems-Helmers for 9 Main Bridge Piers

was delivered in bulk in barge loads of 1,500 barrels. The barges were spotted around the mixer barge in standard position with the cement barge astern, the sand barge at the port side and the gravel on the starboard.

Material Handling

The Lone Star bulk cement was moved from the barge to the 120-barrel Blaw-Knox cement tank above the batching plant by means of a portable Fuller-Kinyon pneumatic pump through a 5-inch steel pipe line. In case of any breakdown in the electrical or pneumatic elements of the pumping system an emergency Chain Belt elevator is provided forward to which the bulk cement

(Continued on page 23)



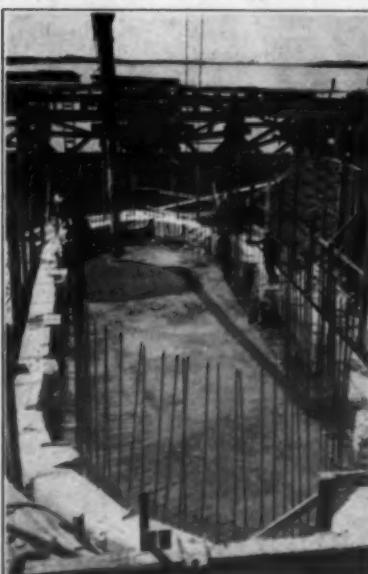
C. & E. M. Photo
Floating Concreting Plant for Mississippi River Bridge Piers

Week-End Paving for Street-Car Tracks

(Photo on page 36)

IN 9 hours and 36 minutes the Nosworthy Contracting Co. of Brooklyn, N.Y., placed 500 cubic yards of concrete between B.M.T. street railway tracks, finishing at 7:40 p.m. Sunday. At 5:00 Monday morning, the first street car passed over the 122-pound rails imbedded in the concrete and with no ties. This job on Livingston Street, Brooklyn, N.Y., involved 1,600 feet of track and is in the heart of the shopping district where a number of large department stores have entrances. The Brooklyn-Manhattan Transit Corp. had found it necessary to lay new tracks on this section of Livingston Street and pave with concrete base between the rails. Because Saturday was the last day the department stores would be closed all day, it was decided to start the work of tearing out old pavement and rails on Friday, at 8 p.m. The original schedule called for the placing of the new concrete starting at 6:00 p.m. Saturday, and finishing up at 5:00 a.m. Sunday, which would give the Incor concrete 24 hours to harden. Considerable difficulty was met, however, in getting the old pavement and rails out, the new rails in place and welded, so that it was 10:00 Sunday morning before any concrete could be placed.

Pouring Started at 10:04 A.M.
At 10:04 a.m. Sunday the Central



C. & E. M. Photo
Concreting Pier No. 1 at Elev. +5

Oysters R in Season for Texas Road-Mix

Washed Screened Shell Used as Aggregate for 14-Mile Contract

SECTIONS of the highway between Port Arthur, the heart of the oil refinery district of Texas and its largest shipping point for oil products, and Sabine Pass, a historic settlement of Civil War days, are subject to frequent overflow every winter during high tides and storms in the Gulf of Mexico. The continuation of this highway, No. 87, leads to the Bolivar Peninsula studded with summer cottages along the Gulf shore and culminating in the Port Bolivar ferry, an integral part of the short route from New Orleans to the island city of Galveston. Traffic is not heavy and the flood conditions do not warrant the construction of the more expensive types of pavement. This section was chosen last winter for experimental work in road-mix top, with washed crushed oyster shell for aggregate. Previous roads using oyster shell have not been successful for this kind of construction. The fullest cooperation between the con-



The Completed Road, Except for the Diverting of Traffic to Edges

tractor and the resident engineer, who has specialized in this type of construction, has developed a smooth-riding, hard surface secondary highway at reasonable cost.

Three contracts totaling 14 miles on Highway 87 were awarded to Haden & Austin, Inc., of Houston, Texas, last spring. Previous contracts for the base course of mud shell, oyster shell as dredged, had been completed. The work of placing the washed crushed oyster shell for the top began about the end of January, 1934. The material prepared at the contractor's own plant had to meet the specifications of the State Highway Department as follows:

100 per cent passing a 1-inch screen
15-35 per cent retained on a ½-inch screen
35-75 per cent retained on a 10-mesh screen
75-95 per cent retained on a 50-mesh screen

The road oil used is known as RO-3 and has an asphalt content of 70 per cent of 100-penetration asphalt. The mix as completed on the road had an asphalt content of 6 per cent.

Placing the Shell

The mud shell was placed 10 inches thick for the base in three layers of 3½ inches each between 3 x 6-inch stringers used as side forms and placed 19 feet apart or 1 foot wider than the final mixed top. The base course was compacted under traffic and constantly bladed to give a uniform section without ruts or holes.

On the completed base the crushed washed shell was spread to a loose depth of 2 inches. It was bladed to the 18-foot width and spread to a uniform thickness with a 10-foot Adams blade grader pulled by a Caterpillar Thirty tractor. A crew of three laborers and the regular tractor and grader operators were kept busy caring for the base and three other laborers and the Fordson tractor, Wehr maintainer and truck drivers for the distributor and three "booster" or hauling tanks made up the crew for shooting and working the top.

An interesting incident showing the difficulties under which the work was continued during the winter brings up an expense item not usually encountered. The shoulders were high during

(Continued on page 19)

Time-Saving Cement With Transit Mixing Solved Traffic Problem

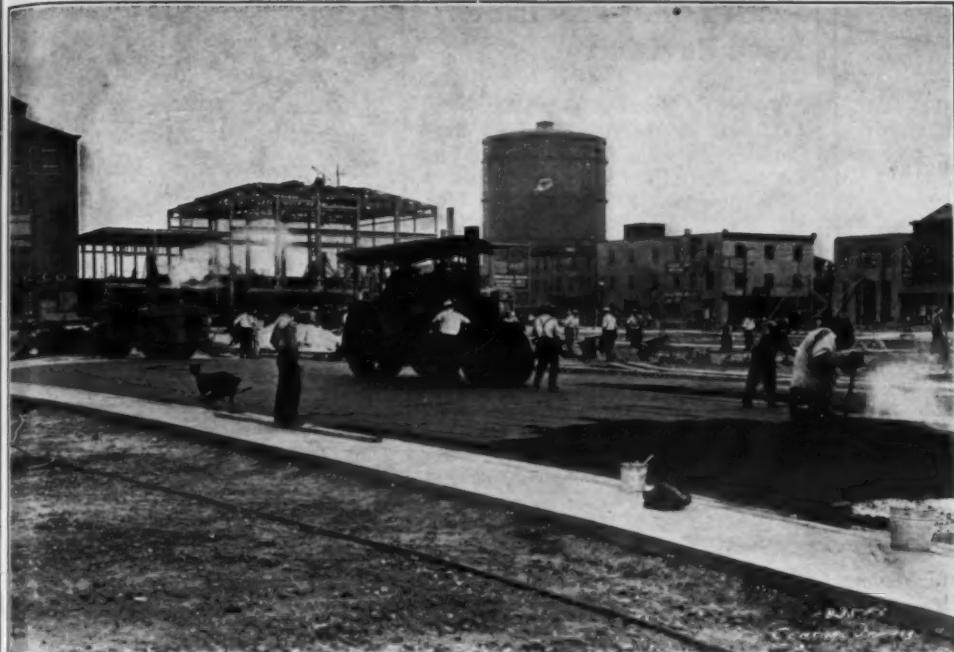
Concrete Mixing Corp. deposited the first load of transit-mixed concrete on the job and the Nosworthy Contracting Co., which excavated the old pavement placed it. Work continued without let up until the last batch of concrete was poured at 7:40 p.m. At 5:00 next morning the first car passed over the new rails on schedule, just 9 hours and 20 minutes after the last batch of concrete was placed. At the main intersection at Nevins Street, 2-inch planks were placed between the rails and at 8:15 p.m. Nevins Street was open to the heavy automobile traffic coming from New York City over the Manhattan Bridge just 10 hours after concreting started. This traffic, especially on Sunday nights, is extremely heavy as it includes cars coming from Manhattan, Bronx and Westchester County, returning to Brooklyn and Long Island.

The Concrete Was Vibrated

The B.M.T. Corp. laid the tracks and welded them and also vibrated the concrete with two International Steel Co. vibrators. A stiffer mix could have been used with the vibrators, but as the time of placing was limited the water ratio was governed by the speed of delivery

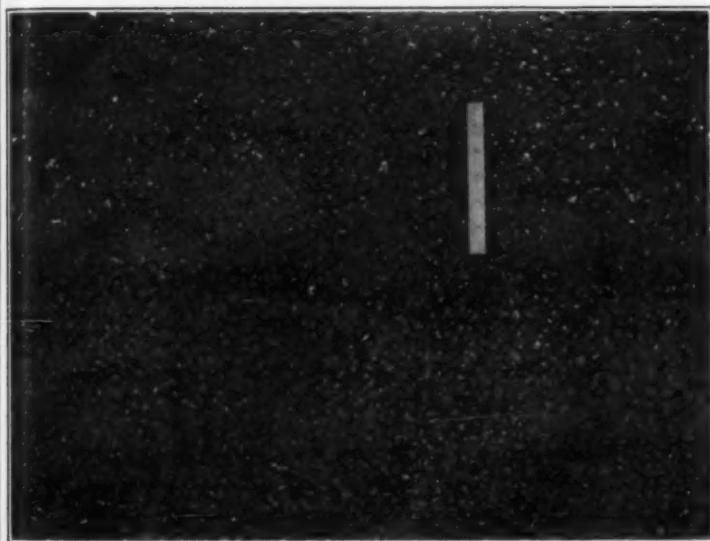
of the concrete from the mixer down the chute to the subgrade rather than to its workability around the rails. Near the end of the job when it was certain that the last of the concrete would have at least 8 hours to harden, a stiffer mix was used.

The street railway cars of the B.M.T. on this line produce a load of 7,500 pounds per wheel, 16 wheels per car, with a 100 per cent impact factor, doubling the static load. The average thickness of concrete under the rail is only 5 inches but it is reinforced with a 6-inch square mesh. The rails were kept to gage with tie rods spaced every 3 feet and deformed ¾-inch bars 2 feet long placed through holes in the web of the rails every 2 feet. The total thickness of the concrete is 11½ inches. It was a 1:2:4 mix with an average of 5 gallons of water per bag of Incor cement. Limestone was used for the coarse aggregate.



General view of operations, taken during the construction of a resilient, hot-mix asphalt pavement of the sheet asphalt type in front of the new railroad terminal in Atlantic City, N.J.*

Constructing a Penetration Macadam surface on the Brayton-Fort George State Highway, New York, using Emulsified Asphalt as binder.*



Close-up of non-skid asphaltic concrete wearing surface laid over old concrete near Howell, Mich. The concrete received paint coat of asphalt emulsion.*

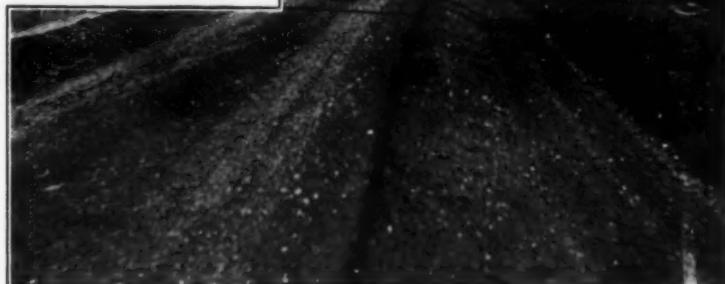


Fourteen miles of State Highway No. 25 near Lexington, Ky., resurfaced with two 2-inch courses of broken stone treated with 2.2 gallons of cut-back asphalt per square yard.*

Constructing low-cost road mix surface in Livingston County, Mich. Prior to mixing with blade grader, the mineral aggregate and slow-curing asphaltic material were disced with multiple disc harrow.*



The recently completed surface on Mesa Road near El Paso, Texas, is of the modified Topeka-mix type, laid on crushed stone foundation.*



*TEXACO ASPHALT PRODUCTS USED ON ALL PROJECTS

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Greetings to Our Readers, Old and New!

If every one thousand new readers may be likened to a new radio station added to a network, we are glad to welcome this month thirteen new stations to our nation-wide group of readers.

We greet our many new friends among State and County engineers and highway officials and our editorial heart is warmed by the continued interest and cordial gestures of our constant readers among contractors.

A Healthful and Prosperous New Year to All!

Where Are Roads Needed?

A prominent good roads enthusiast speaking recently before a group of petroleum producers emphasized that extravagant sums spent for boulevards between cities or paralleling railroad tracks, had resulted in a situation whereby there are too many roads where they are not needed and not enough where they are needed.

We do not agree with the reported statement that there are, "too many roads where they are not needed," because we feel that wider and new routes are greatly needed between cities. New Jersey has set a noteworthy example in its new alignment of routes for through traffic, and Connecticut is starting out on a similar program through a new location for U.S. Route 1 at the east and west ends of the state by the projected construction of the Merritt Highway.

Existing main routes between cities are overcrowded on week days with heavy truck traffic, and on week-ends by the cars of city dwellers seeking fresh air in the country. We need to build many boulevard routes for the heavy interurban or urban-to-country traffic but we also, as the speaker referred to suggests, need many thousands

of miles of secondary roads to make it possible for the farmer to get to town 365 days a year.

Many editors may think there is too much talk about getting the farmer out of the mud, but let them leave their desks and drive day in and day out from one construction project to another, using the secondary "back roads" for short cuts as we do, and they will appreciate the farmer's road problem. We have been marooned in a small Illinois town because it rained too much one night and it was just impossible to navigate the clay road until the sun hit the surface good and hot for a few hours. We have slid off the high crown of a Pennsylvania clay road into the ditch ten times in a single mile. And Louisiana and Arkansas have furnished precarious driving in wet weather. Yes, give the secondary roads an all-weather non-skid top on a well-drained foundation and make it wide enough for two cars to pass at any time.

Juggling Labor

With contracts operating in close proximity under varying labor regulations imposed by state laws, Construction Code labor provisions, and PWA restrictions, there has naturally developed a feeling of envy on the part of those operating under the strictest requirements toward those operating under less strict provisions. When a single contractor happens to be running two or more jobs with varying restrictions, this envy might turn to a temptation to juggle his labor by carrying it on the payroll which permits the greatest number of hours and the lowest pay and using the labor in times of need on the job with the tighter restrictions. Moving labor from one job to another may well be a necessity, but a contractor must realize that there is a reason for present-day labor regulations and they form an integral part of his contract.

Old Timer Reports

To the Editor
Contractors and Engineers Monthly

My December copy of CONTRACTORS AND ENGINEERS MONTHLY has just arrived, and as usual I have glanced over the articles before getting down to the business of reading it carefully.

On page 34 you show an illustrated article entitled "Fifty Years of Shovel Construction," and what was my amazement to see there at the top of the page, not merely one shovel that I had charge of, but *both*, at different times of course. And I will say too that that old traction-wheel shovel shown down in the left-hand corner looks a great deal like one owned by the Sibley Construction Co. at Spokane, Wash., when I was their Chief Engineer.

Now about the one in the upper left-hand corner. As you say, this shovel was operated for years by the Cincinnati, Jackson & Mackinaw R. R. Co. which later was taken over by the Big 4 R. R. interests and named the Cincinnati

Northern. This shovel operated at Greenville until the Greenville Gravel Co. bought all the gravel land around the vicinity of Fort Jefferson in 1904 (Greenville); and after that, I think the railroad secured its ballast under contract from this concern. I was First Assistant to the Chief Engineer of the C. N. (W. D. Williams) and left the company in 1905 to go to Panama.

That shovel on the right-hand side was turned over to me, new, at Gatun in 1908 or 1909, when I was Superintendent of Construction of the Gatun Dam and Spillway. It worked in the borrow pit adjacent to the Dam—ideal conditions—when that record was made. My brother-in-law, C. R. Hughes, was in charge of the work. You might have added there that this record of 5,554 yards was made in the regular 8-hour day worked at Panama—one shift of course. Eight hours for shovel men, 9 for train crews and unskilled labor, and 24 for foremen and superintendents!

E. O. KEATOR
Dayton, Ohio, Dec. 17, 1934.

PWA Labor Provisions Need Revision

Frederick Hoitt, editor, *The Nerba*, published by the New England Road Builders' Association, has voiced a plea for revision of the labor provisions on PWA projects. Please take the floor, Mr. Hoitt, and repeat to our readers your plea for more common sense in the selection and working hours of labor.

"Take the provision of the law that (except in executive, administrative, and supervisory positions), so far as practicable and feasible, no individual directly employed on any such project shall be permitted to work more than thirty hours in any one week. That has been carried into the regulations and administration as a limitation to 8 hours per day and to 30 hours per week. It operates to the distinct detriment of the employee. A 30-hour week does not jibe with an 8-hour day in any case, and particularly so in a seasonal occupation that is subjected to weather hazards. It means less than an average of 30 hours per week for the worker no matter how one tries to arrange the working schedule. The same is true of a 6-hour day. We have seen it written somewhere recently that the President now feels the hourly wage the worker receives is not of so much importance as his annual wage. That point in substance has been made many times by contractors in attempting to defend the industry against undue restriction in hours of employment, in view of its seasonal character. This matter of restricting highway workers to an average of less than 30 hours per week—and in any event they can only work in the New England climate eight or nine months of the year—is worthy of re-consideration.

"Limiting employment to those taken from lists prepared in the political subdivision where the work is done is another restriction of good intent, but has proved to be ill-advised and accomplishes no sound economic result. It puts some men out of work for the benefit of others, shifts some men from one employer to another, and has brought insecurity in employment to many men who formerly had a justifiable feeling of security in their jobs. The petty requirements that affect every one whose service in connection with the work is but slight and incidental, and the record and report making requirements, are too numerous to comment upon in detail.

"This is not a complaint on behalf of contractors who want to get away with something and have found the restrictions and regulations an obstacle. We hold no brief for contractors of that sort. It is based on the experience and the reactions of honorable contractors who have been struggling with some of this PWA work. It would be a fine thing if those responsible for the preparation of the proposed additional Public Work program would call into conference a representative group of responsible and experienced contractors from different sections of the country to talk these things over with a view to incorporating reasonable and desirable changes in the law and regulations that may affect future similar work."

Thank you, Mr. Hoitt.

Are You Losing Profits Through Lost Time?

Because of space limitations, Part IV of this article on ways of avoiding lost time in bituminous road construction does not appear in this issue as announced. It will however be continued in the February issue.



Frank Beaven Cartoon, Courtesy, New York America
"I guess we should have thought of this before!"

Loaded with Dynamite!

People are prone to think of dynamite as a synonym for disaster; even cartoonists are fond of portraying tense situations as "Loaded with Dynamite!" The phrase is a favorite with writers who seek to get across the idea of fearsome circumstances. High explosives should command respect but not inspire unreasoning fears. The public at large really knows little about commercial explosives, hence, their fear about them.

Have you noticed that whenever someone finds a few cartridges of dynamite in any urban community, the quantity of explosive is usually reported as "enough to demolish one or more city blocks"? Such exaggeration springs from ignorance or over-zealous efforts to tell a vivid and impressive story. News writers may even add these garnishments because it is customary to do so, but unfortunately they are misinterpreted by many people who accept the statements at their face value.

Not As Bad As Pictured

Here are a few facts about dynamite as told by du Pont. Two sticks of dynamite weigh approximately 1 pound. A quarryman who loads and fires such a charge in solid rock is usually well satisfied to secure an average yield of 4 tons of broken stone. In ditch-blasting under normal conditions a charge of dynamite can be expected to throw out about 1 cubic yard of material per pound of explosive used. Considering that such charges are loaded expertly to secure the maximum effect, one does not need higher mathematics to figure that an explosion of a half-dozen cartridges, unconfined, either inside or outside a building, by no stretch of imagination could demolish even one city block.

In times of great conflagrations in cities, dynamite has been utilized to demolish buildings in the path of the flames, so that the fire fighters might work effectively to insure control. That expedient was resorted to at the time of the San Francisco fire. From 300 to 600 pounds of dynamite were used to demolish a single frame structure.

Whenever anybody wants you to believe that a few sticks of dynamite have the power to demolish one or more city blocks, just smile.

It is interesting to consider how fully and ingeniously the early engineer applied his limited resources to foundation work. Wood piles and sheet piles, cribs and cofferdams have been used since the times of the ancients, and at the end of the 18th Century the principle element lacking was steam power. Diderot's Encyclopedia of Art and Science depicts a bridge foundation installed in 1770 showing elaborate cribs and a cofferdam made tight with puddle and sheet piling.

Carsten S. Proctor, Foundation Engineer, New York (Paper before Metropolitan Section, Am. Soc. C.E.)

Top Like Pre-Mix Made by Road-Mix

Fast Retread Paver and Asphalt Emulsion Used by Welfare Labor

By WILLIAM R. GORDON
County Superintendent of Highways,
Albany County, N.Y.

(Photo on page 36)

BY the judicious selection of aggregate and special care in mixing with the asphalt emulsion, using a retread paver, the maintenance forces of Albany County, N.Y., were able to produce a uniform road-mix job, much denser than the usual stone aggregate road-mix and closely approximating a graded pre-mixed pavement, on several county roads during the past season. The problem on George Street, Green Island, N.Y., a heavily traveled thoroughfare, was to produce a city pavement at low cost. The project, an old brick pavement, was 0.8-mile long, 36 feet wide between curbs and included an abandoned double-track trolley line in the center.

Preparing Base

The foundation was prepared by filling all depressions and space between the trolley tracks with pre-mixed material, using 7 gallons of No. 5 Colas emulsion to 10.5 cubic feet of $\frac{1}{8}$ to $\frac{1}{4}$ -inch stone mixed in a concrete mixer, placed to produce a uniform surface and rolled with a 12-ton Buffalo-Springfield roller. Where no patching was necessary, a prime coat of $\frac{1}{8}$ -gallon per square yard was applied on the old brick to insure a bond with the new pavement.

Shooting and Mixing

On this base No. 2 stone, $\frac{5}{8}$ to 1-inch in size, was spread to a depth of $2\frac{1}{2}$ inches loose for the full width, except about 2 feet from the curb on each side, and Colas No. 5 emulsion applied at the rate of 0.5 gallon per square yard. This was followed immediately by mixing with an Adams Retread Paver drawn by a Caterpillar Sixty tractor. The retread paver mixes a strip from 8 to 11 feet 6 inches wide and the 32 feet was mixed in three strips. One pass of the machine was sufficient to coat the stone and leave it spread to the same thickness of $2\frac{1}{2}$ inches as laid. No. 1 stone, $\frac{1}{8}$ to $\frac{1}{4}$ -inch, was then spread on this by a Handy-Sandy chip spreader in an amount equal to $\frac{5}{8}$ -inch thickness. Washed screenings $\frac{1}{8}$ -inch and under was then spread on this equal to $\frac{1}{4}$ -inch thickness.

This was followed by a second application of No. 5 emulsion at the rate of one gallon per square yard and again mixed by the retread paver. This second mixing required at least two passes of the machine and in some cases three were used. Also further passes were

made to shape the crown properly, using the rear or finishing blade only. The finished thickness for the center 28 feet averaged $2\frac{1}{2}$ inches but at the curb it was tapered to 1 inch to retain as much of the curb height as possible.

After proper shape and crown had been obtained, the pavement was rolled with the 12-ton roller, using water to prevent sticking to the rolls. After rolling, a very light application of $\frac{1}{8}$ -inch stone was made, using only the amount sufficient not quite to fill the voids and the rolling was continued with a broom attached to the roller to work the stone into the voids. A gang broom drawn by a truck was also used to eliminate as much as possible all broom streaks.

A seal coat of 0.3-gallon of Colas per square yard was then applied and chipped with $\frac{1}{8}$ -inch washed screenings. No traffic was allowed over the road

until it was completed. This was possible as there was a parallel street which could temporarily handle the traffic.

The Retread Paver

The Adams Retread Paver is mounted on four wheels equipped with solid

(Continued on page 11)

Counties Buy Thirty-Fives

Montgomery County and Johnson County, Ind., have purchased Caterpillar Thirty-Five diesel tractors from the Indiana Equipment Co., Inc., of Indianapolis, Ind.

COMPLETE PROTECTION

for YOUR JOB . . . YOUR POCKETBOOK
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• CLEVELAND • TRENCH GUARDS

New barricade development—Gives more complete protection than previously possible. Extremely low initial cost. Practically no maintenance.

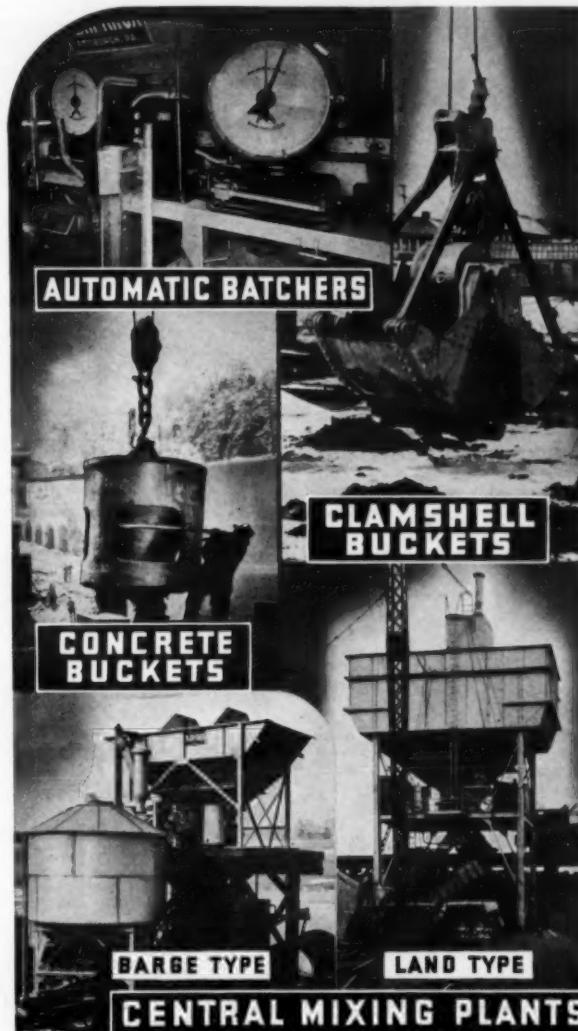
Patented design permits formation of unbroken fence around job. Cuts in half number of "legs" required. Built-in flag-and-lantern holder.

"Trench Guards" do a 100% job. Simple—Strong—Practical. Write for complete information today.



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CLEVELAND, OHIO



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MORE PROFITABLE WORK

Blaw-Knox equipment helps the contractor to maintain schedules and complete his work on time. It is low in maintenance cost and pays for itself quickly in service. It is modern and in many instances has anticipated specifications. Blaw-Knox equipment helps the contractor to make profits in the face of severe competition. It's a twenty-eight year old custom among contractors to "deal with Blaw-Knox." This is an especially good habit to continue as it marks the maximum worth in equipment, satisfaction and service to be obtained for the dollar expended.

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A HYB-LUM WHEELBARROW

Reduces
Hauling
Costs

Let us explain why

SHEET ALUMINUM CORP.,
JACKSON, MICH.



Work All Winter

Hints on the Care of Equipment During Winter Months

A HELPFUL hint for contractors interested in winter work comes to us from *Cletrac Facts*. It is pointed out that the real cost of operating a tractor and haulage equipment is not determined by the amount of fuel and lubricant used but must include the original purchase price spread over the total amount of work actually done with the equipment in a given time. If the tractor can be kept busy doing useful work all winter, the cost per unit of work will usually be less than if the equipment is used only in the summer months.

All kinds of construction work on railroads, highways, buildings, dams and levees are now continued right through the cold weather. Emergency public works contracts make winter work inevitable. No single construction project should be permitted to mark time through the winter. Cold weather methods have been so greatly developed that all normal operations can proceed in practically any weather.

Care of Engines

All internal combustion engines require a certain operating temperature for the most efficient performance. To secure the best results in fuel economy and lubrication, the engine temperatures must be approximately the same in winter as in summer. It is therefore essential, in extremely cold weather, to cover the radiator and hood sufficiently to keep the cooling solution in the radiator up to normal.

Freezing weather requires special attention. Never let the tractor stand idle with only clear water in the cooling system. Either drain the cooling system completely or use an anti-freeze solution of proper strength and quality for the lowest temperature likely to be encountered. If the tractor is drained to prevent freezing, make sure all water is out of the system and do not replace plugs or close the drain cocks until you are ready to refill the cooling system. After draining, crank the engine a few turns to remove water from the pump.

Although the initial cost of glycerine is greater than alcohol, it has the advantage of not evaporating at the higher operating temperatures. For this reason, it may be less expensive—over a season's operation—than alcohol, but it is essential that hose connections, water pump and radiator be tight. Otherwise the cost of glycerine, due to loss by leakage, may be much higher. Unless hose connections and pump packings are in excellent condition, they should be replaced by new ones before using any anti-freeze. Never use the ordinary commercial grade glycerine which contains acid and may damage the radiator.

Anti-Freeze Proportions

The following tables taken from Letter Circular LC-28 issued by the U.S. Bureau of Standards, gives the proportion of different kinds of anti-freeze for various temperature conditions:

Pints of Anti-Freeze per Gallon of Water for Protection at Following Temperatures:				
Anti-Freeze	10°	0°	-10°	-20°
Denatured Alcohol 100 Proof	3.4	4.9	6.5	8.5
Denatured Alcohol 100 Proof	3.3	4.7	6.0	7.7
Glycerine U.S.P. (95%)	3.8	5.3	7.1	9.0
Radiator Glycerine (60%)	10.0	18.7	39.0	106.5
Ethylene Glycol (95%)	2.7	4.0	5.1	6.5

Specific Gravity of Mixtures for Protection at Following Temperatures:				
Anti-Freeze	10°	0°	-10°	-20°
Denatured Alcohol	0.968	0.959	0.950	0.942
Glycerine	1.098	1.112	1.131	1.147
Ethylene Glycol	1.038	1.048	1.064	1.084

Lubrication

Probably more tractor troubles develop from wrong lubrication than all other causes. Cold weather causes all lubricants to become thicker. Before attempting to operate a tractor in cold

weather, drain all summer lubricants from the engine, transmission, and track wheel system and refill with the proper grades for the lowest temperature at which the tractor is to be operated.

Diesel Fuels

Since the flowing quality of diesel fuels is affected by temperature, be sure the viscosity of the diesel fuel used in a diesel tractor engine is not more than 800 seconds, as measured by the Saybolt Universal method, at the lowest atmospheric temperature at which the diesel is to be operated. Too heavy a diesel fuel will not flow rapidly enough at low temperatures properly to supply the fuel injection pump.

Storage Battery

Special attention should be given the battery during the cold winter months. A fully-charged battery will not freeze at temperatures ordinarily encountered, but a discharged battery will freeze at 32 degrees F, in which case the plates

(Continued on page 29)

A Hand Flashlight With One-Mile Range

An improved flashlight which can well be called a searchlight has been announced by the Bond Electric Corp., Jersey City, N.J. This Bond mile-range searchlight is made in two long tubular fiber barrel sections, each a complete self-contained unit. It can be used as either a five-cell searchlight or a long mile-range ten-cell searchlight. It only requires screwing the two 5-cell sections together. A large octagon non-rolling focusing searchlight head holds a brilliant reflector and there is a specially-designed tubular bulb marked 11.8V included, which must always be used with the ten cells. In the spare bulb carrier there is a 6.2-volt bulb which must be used with the 5-cell searchlight and an extra 11.8-volt 10-cell flashlight bulb. This searchlight is controlled by a 3-way safety switch, assuring positive action at all times. All

fitting are heavily chrome-plated and brilliantly polished to a smooth silver-like surface.

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shovel

The New Koehring 801 Shovel — is convertible to crane or dragline — furnished with gasoline, diesel, oil or electric power — independent and positive, chain or cable crowd — sturdy, high strength welded shovel boom — Koehring hydraulically cushioned clutch and the exclusive Koehring boom foot shock absorber . . . For more details and specifications — write for the new 801 bulletin.

KOEHRING COMPANY
MILWAUKEE Division of National Equipment Corporation WISCONSIN

(Advertisement)

Motor Grader "Boxes Out" Road Single Handed

On a central Utah road job last fall, according to a recent report one Austin-Western No. 77 alone did all the work of "boxing out" the right-of-way in preparation for the gravel. To get a uniform grade in this kind of country usually takes the combined effort of the heaviest tractor and grader, along with a gang of men and teams to move the rocks.

The general project was the relocation of a road leading up into the mountains. Since the work laid out for the grader was to box out the right-of-way and get ready for the gravel, and since most of the road had been open to traffic for several months, the first step was to scarify the base. The manner in which the No. 77, with its eight 40"x8" tires on the rear, dug out the rocks won the admiration of everyone on the job. Some of these rocks were too big for one man to lift, but by skilful handling of the hydraulic control on the scarifier, they were rooted out.

For this type of work, when working near the shoulders, the narrow rear tread of the Austin Sr. Dual Drive is a great advantage, because it allows the operator to cast his load well beyond the rear tires. Compare this with the type of machine which is dual drive with only single tires on the rear. This design is necessary because dual tires cannot clear the load.

The following is quoted from the report of an observer on the Utah job:

"Also along this line, I have found a great advantage working with the shiftable front axle, in that it allows the grader to work close to the windrows on the sides of the road without running the front wheels up on the material, and at the same time permits throwing the material further with the blade. Remember that when you shift the axle over you also get the benefit of the bracing effect on the long side, where it is needed, which allows you to take a bigger load. If you have not operated a shiftable-axle job, then you don't know the thrill of power-steer."

This power controlled shiftable front axle referred to is a recent development in Austin-Western Motor Grader design. It is obtainable upon special order.

County Breaks Own Records for Low Costs

A report of a county project in which aggregate was placed on the road at 46c less per yard than all previous county production costs, or contractors' bids, has been received from Wisconsin.

This achievement came to light at the close of a two-year period in which competitive tests were conducted for the selection of a permanent crushing and screening plant. The Austin-Western Company offered their No. 100 plant plus their cooperation in determining what equipment was best suited to this particular county's needs.

The No. 100 Plant was "sold" not only to the officials of the county but to the mechanics and truck drivers as well. When the crushing plant question began to take form it proved difficult to specify the capacity of the plant desired. After some delay, however, the officials decided on a capacity of 35 cubic yards per hour of $\frac{3}{4}$ -inch material, crushing 50 per cent. Although a two-crusher plant was needed to produce the required production, some of the bids received were for one-crusher plants, hoping to secure the business on a price basis. After tabulating the bids, the commissioners agreed to inspect the No. 100 Plant and two others. The next step was tests in production and operating efficiency.

As a result of these tests the County Board, voted 19-to-2 in favor of purchasing the No. 100 Austin-Western

(Advertisement)

Plant, after receiving a report from the County Road and Bridge Committee which showed that it had placed material on the road at a cost of forty-six cents per cubic yard less than all previous county production costs and contractors' bids.

The pit foreman was enthusiastic when asked about the production. "One day in eight and one-half hours," he bragged, "we turned out 576 yards of $\frac{3}{4}$ -inch stone with 55 to 60 per cent passing through the crushers. I timed the plant once and it was averaging four cubic yards, that is a truck load, every two minutes and fifty seconds."

Contractor Builds Bridges with 3-4 Swing Shovel

Edgar D. Otto, general contractor of Downer's Grove, Illinois, reports four small bridge jobs successfully completed with an Austin-Western Badger Shovel used as a crane, pile driver and excavator.

"We worked about ten miles from the

(Advertisement)

railroad," says Mr. Otto, "and none of the bridges leading to the work are strong enough to carry a large machine. The Badger gave us the real advantage of being light and easily moved."

The bridge contracts were one for the War Department at Saverton, Mo., and three for the Illinois Highway Department in Adams and Pike Counties.

"The machine is now equipped with a standard thirty foot crane boom and handling a $\frac{3}{8}$ -yard Keisler digging bucket. It handles this bucket very nicely and we are well pleased with this machine for concrete bridge construction. Abutment excavations on our Fishhook Creek Bridge are approximately sixteen feet wide by eighty feet long and about fourteen feet deep. On any of these small jobs the time to excavate is never very long and we find this small outfit handles the work plenty fast enough. After the excavations were finished, we removed the bucket and used the Badger for driving piles in connection with a stiff leg derrick and 2500-pound pile hammer."

(Advertisement)

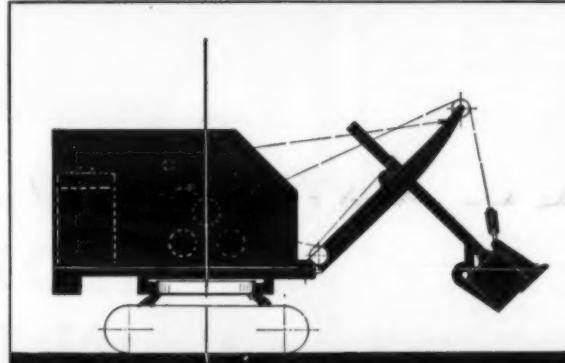
Mountain Slides Give Real Test to Road Grader Construction

Recent inspection of grader equipment in two California County Districts proved the structural value of such features as the one-piece main frame, flexible pivoted front axle and large circle with a nine foot blade.

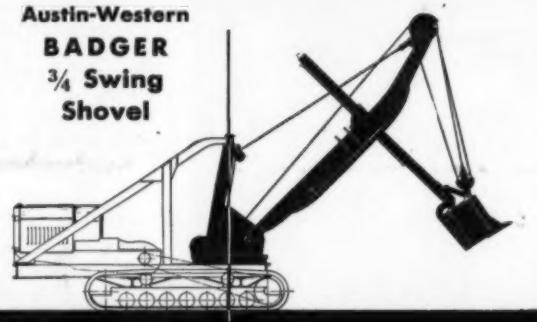
In the first district visited covering portions Districts 1 and 5 of Los Angeles County, there are 3800 miles of road including many miles of mountain roads where construction and maintenance are especially difficult. An Austin-Western No. 8 Grader had been at work for about six months cleaning up slides which are difficult to handle in this particular territory.

The inspector reports, "On close examination I could not find any part of the grader sprung or out of alignment in any way whatever. Every adjustment and every movable part was functioning perfectly, wheels ran true, and no evidence of wear or breakage."

LET YOUR JUDGMENT TELL YOU



PARTS IN BLACK SHOW MASS MOVED ON EVERY SWING



-Which is faster?

Your eye will tell you in the above comparison of shovel designs that a far greater weight must be moved in the one on the left. This becomes an extra load to be controlled as the boom swings. Do you recognize the handicap on speed? First, the extra weight must be put in motion. Then, after a quarter, half, or three-quarter swing in a second or two of time, it must be brought to a full stop.

The Austin-Western Badger Shovel has hung up an enviable record of more buckets per hour—more yards—than larger heavier shovels because of its

design. The boom alone, supported and pivoted on an "A" frame, swings like the arm from the shoulder, without moving the whole body. There is less weight to move, less to stop.

Considering this variation of shovel design, you will find a majority of your jobs better suited to this faster, lighter type—the Austin-Western Badger. Many other advantages will be discovered—Time saved through faster transportation—Fuel and oil saved through economical operating cost—Greater flexibility on the job. Send coupon below for details.

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Please send descriptive bulletin on the Austin-Western Badger.

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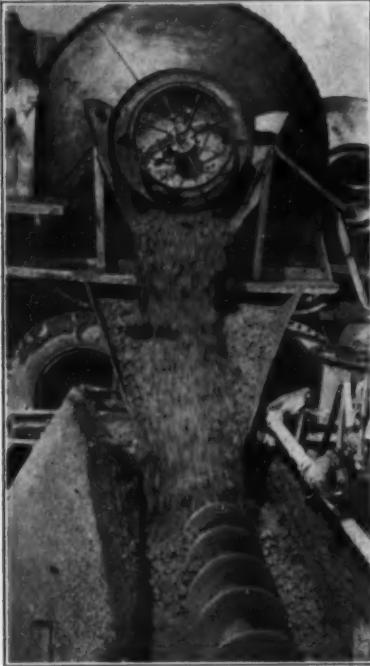


DUMP WAGONS

Fast Paving With Mixer-Trucks

(Photo on page 36)

THE contractor started the clearing and grubbing of the Lincoln-Concord section of the Cambridge-Concord, Mass., highway on June 20, 1934, and the pouring of concrete on September 6. On the 100-foot right-of-way for this project the contract called for the laying of four 10-foot strips of concrete 8 inches thick. The Massachusetts specifications call for the preparation of the subgrade by spreading a 12-inch gravel base in two equal 6-inch layers and rolling thoroughly. The contractor made the borrow for the gravel base from scattered pits along the section, using his Lorain shovels loading to the fleet of 10-wheel Mack and Sterling trucks, six of which were used for the gravel base. The gravel was spread with a Warco one-man grader and then rolled with a Huber 10-ton gas roller. The grade was left 1 inch high.



C. & E. M. Photo

Delivering a Batch to the Spreader

The 8-inch Blaw-Knox steel road forms were set, in two lines for the first strip poured, by a crew of ten men who prepared the trench and handled the forms, lined them, tamped the bases for a firm foundation, and finally oiled them. A crew of six men was sufficient when only one line of forms was needed and the other side was against the slab already poured. A foreman and four men worked on the fine grade between the forms, hand-cutting the grade to match the scratch templates and finally rolling the subgrade with a 6-ton Buffalo-Springfield gas roller. The grade was sprinkled by a truck with a sprinkler arm leading from a 750-gallon tank carried on a Ford truck. This was used either before or after the steel was placed to keep the grade in the proper condition so as not to absorb water from the mix. The sprinkler bar was hinged so that it could be pulled back against the truck when traveling. As a part of the same crew three men pulled the forms from the slab poured the previous day, cleaned the forms and loaded them on one of the service trucks.

Placing Steel and Expansion Joints

The concrete slab was reinforced throughout with 609 pounds of steel per 100 square yards, in the form of bar mats. These mats were made up by subcontract ahead, and placed on the shoulder. Two men of the concreting crew were used to set these mats on the grade

Well-Maintained Units and Good Organization Made 4,500-Foot Pours a Daily Average

well ahead of the pouring and also to place the expansion joints at 57.2-foot intervals. The expansion joints were made up of $\frac{1}{2}$ -inch Flintcote expansion joint material with a cap 5 inches long on the side away from the approaching concrete, $\frac{1}{2}$ inches on the other side and staked in place with four iron pins on the far side. The expansion joint material was used straight and set about 1 inch below the top of the slab which has a crown of $1\frac{1}{2}$ inches for the two center slabs and $2\frac{1}{8}$ inches for the two outer slabs, a total crown of $3\frac{1}{8}$ inches. After the pavement was cured for a few days, the expansion joints were poured by hand, using an Aeroil asphalt kettle and hand pouring pot.

Seven $\frac{3}{4}$ -inch round dowels each 2 feet long were inserted through the expansion joints for each 10-foot width of slab, with the portion away from the approaching concrete oiled and capped at the tips with metal caps 2 inches long. The near end of each dowel was wired to the transverse reinforcing bar of the mat.

In addition the adjacent slabs were tied together with $\frac{1}{2}$ -inch dowels 4 feet long bent and laid against the forms for the initial slab and then bent out by means of 5-foot lengths of pipe for leverage. The dowels were wrapped with paper to prevent the concrete adhering to the metal.

Pouring with Pachyderms

As ungainly looking as a herd of great elephants, but as skillful in the performance of their work, the fleet of six Jaeger truck mixers was loaded at the batching plants and mixed the concrete en route to the slab. Each carried a 5-yard batch of concrete and poured a 20-foot section of slab before starting off again for the batching plant for another load. By ceaseless movement, except for the one-half hour lunch period, the truck mixers were able to pour an average of 4,500 feet of 10-foot slab 8 inches thick in 12 hours.

The sequence of pouring the four strips of concrete was influenced by the truck mixers which were made to pour from the left side. Numbering the slabs 1, 2, 3 and 4 from left to right, and with the Concord end of the work at the top of the plan, the slabs were poured as follows: No. 3 strip was poured from Concord to Lincoln with the truck mixers running on the gravel of No. 2 strip; the No. 2 strip was poured with the trucks running on the gravel of No. 1 strip; the next strip poured was No. 4, also running from Concord toward Lincoln as was No. 2, with the trucks run-

ning on the concrete of No. 3; then the last strip poured, No. 1, was laid with the trucks running on the concrete of No. 2 running from Lincoln toward Concord, for the Concord half and then they went back and poured the Lincoln half in the same direction.

Crews That Click

"Concrete onto the grade means money in the bank," said one contractor in a discussion of the many ways in which money can be lost or made in a

(Continued on page 14)

For Low-cost Handling of Loose Materials
Type 27 Lift-Dump Truck
Patented
One truck serves several inexpensive Skid-Dump Bodies. Design of body to suit conditions. For hand, chute, or power loading. Cap. 3 yards. Standard transmission, or 2-speed forward, 2-speed reverse, optional. Gasoline propelled. Hydraulic lift and dump.



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No wonder more and more industries are turning to Chrysler for the advantages only Chrysler gives. No wonder that Chrysler engines run better, last longer, deliver more power, cost less. It's just a typical example of the miracles made possible by modern industrial leadership.

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UNIVERSAL CRUSHING AND SCREENING PLANTS Universal—oldest of its type



Complete crushing, screening and loading plant with primary jaw crusher, secondary roll crusher and power unit.

CONVENIENT—ECONOMICAL—DEPENDABLE

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UNIVERSAL CRUSHER COMPANY, 620 C Avenue West, Cedar Rapids, Iowa

Simple Essentials for Winter Concrete

(Photo on page 36)

FOLLOWING are the essentials of successful winter concreting methods reduced to the simplest possible terms. Applied in the light of the practical requirements of each job, and with a weather eye always on the thermometer, they are bound to lead to satisfactory results.

Quantity of Mixing Water

Follow sound concrete practice; use no more water than required by placing conditions. This is even more important in cold weather than at normal temperatures.

Heated Mixing Water

Water may be heated by exhaust steam released at the bottom of the tank, by steam coils, or by direct-fired boilers. It pays to have more than enough hot water; only a large reservoir can deliver water at uniform temperature. A low-pressure boiler of ample size, mounted on skids if the mixer is moving, discharging into the measuring tank of the mixer, is desirable. Under severe conditions, it pays to protect the mixer tank. Excessive water temperatures should be avoided; 150 degrees is a good working limit—never exceed 180 degrees.

Heated Aggregates

Aggregates should be heated with care; dry heat and excessive temperatures should be avoided. The soundest method is to store the aggregate in compact piles, underlaid with perforated low-pressure steam pipes. Given sufficient time, the exhaust steam will raise the aggregate temperature uniformly and drive out all frost. Heat all parts of the pile thoroughly; under severe conditions cover the stockpiles. Be sure the aggregates are fully heated when withdrawn from the stockpiles—systematic handling will prevent the use of cold materials and minimize the need of heat protection.

Thorough Mixing

It pays to mix thoroughly; additional mixing permits the use of less water for a given workability, and that means increased concrete strength.

Prompt Placing

Mix the concrete as close to the point of deposit as possible. Transportation from the mixer to the work should be studied. Move the concrete no further than necessary, avoid delays, and guard against heat loss en route. Spread, compact and finish the concrete promptly and then apply protection immediately. Early strengths depend upon the speed with which concrete is placed and protected, heat losses are highest during the first hour after placing.

Heat of Hydration

All concrete generates heat, due to the hardening action of the cement; some cements generate this heat rapidly,

other slowly. Special low-heat cements should not be used in cold weather, as their rate of hardening is slow. This heat, if held in the concrete, greatly assists hardening. Incor cement develops much of its heat of hydration at early periods and prompt covering will retain this heat as well as that contained in mixing water and aggregates. In cool weather, 45 degrees or above, the heat of hydration of high-early-strength cements may be utilized to reduce or eliminate the need for applied heat; in cold and in freezing weather it contributes to the heat retained in the concrete and helps offset losses due to radiation.

Protection

Protection against heat losses should be adequate to maintain the desired concrete temperature at all points in the structure for the full time required. Methods vary with the type of structure and exposure. Wet burlap, heavy beds of straw, plus canvas coverings in cold, windy weather, are used effectively to protect mass structures, even highway pavements. Canvas enclosures contain-

ing heating apparatus, such as perforated steam pipes or salamanders, are used for bridges, buildings and similar structures. Costly wood housings are

unnecessary when a high-early-strength cement is used because the period of heat curing is so short, even under

(Continued on page 11)

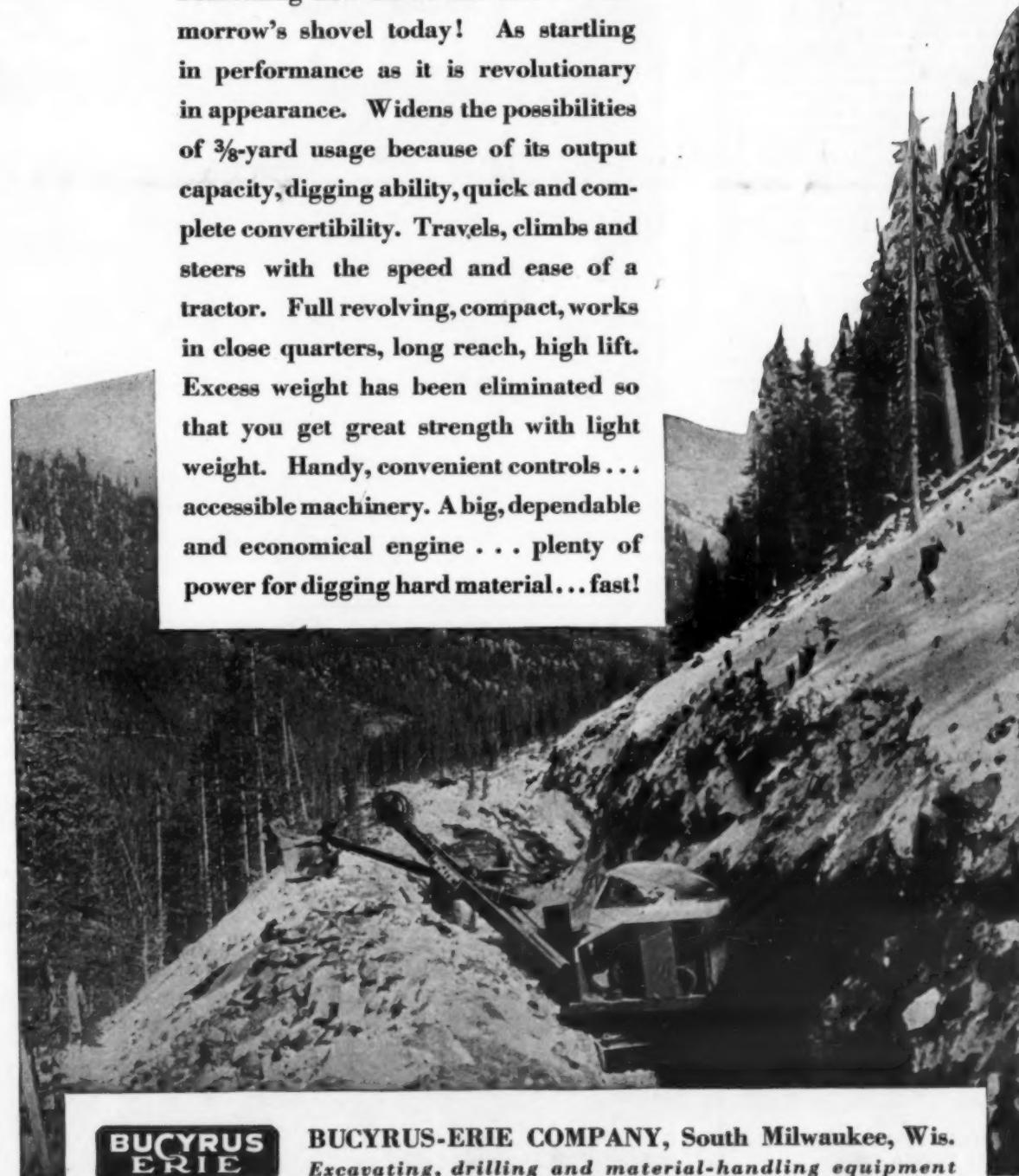
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Something new under the sun . . . tomorrow's shovel today! As startling in performance as it is revolutionary in appearance. Widens the possibilities of 3/8-yard usage because of its output capacity, digging ability, quick and complete convertibility. Travels, climbs and steers with the speed and ease of a tractor. Full revolving, compact, works in close quarters, long reach, high lift. Excess weight has been eliminated so that you get great strength with light weight. Handy, convenient controls . . . accessible machinery. A big, dependable and economical engine . . . plenty of power for digging hard material . . . fast!



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Excavating, drilling and material-handling equipment

Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

Relationship Did Not Affect Municipal Contract

That the Superintendent of Streets was the father of the treasurer of a contracting company and father-in-law of a clerk of that corporation, and that the president of the company was a member of the Republican State Committee and the municipal selectmen were Republicans, did not invalidate a street improvement contract, decided the Massachusetts Supreme Judicial Court in the case of Dealey v. Selectmen of Town of Watertown, 180 N. E. 621.

Subcontractor's Wall Falls, General Contractor Liable

A Tacoma building permit obtained by a general contractor involved the demolition of a wall. This work was sublet. A local ordinance required the wall to be taken down story by story. The subcontractor tried to pull the whole wall over on the lot, but it fell into an adjacent street, killing one occupant of an automobile and injuring others. Suits aggregating \$211,350 were filed against the city, the owner, the general contractor and the subcontractor.

The Washington Supreme Court decided (Amann v. City of Tacoma, 16 Pac. 2d, 601) that the city and the owner were not liable, but that the general contractor and the subcontractor were. The latter was liable because his violation of the ordinance caused the accident, and the general contractor was liable because the subcontractor was acting for him. The following statement by the Supreme Court will give a general notion as to what responsibilities a general contractor assumes in taking out a building permit.

"Walesby [the general contractor] agreed in writing to all the stipulations contained in the permit, and therefore agreed to do the work in compliance with the building code. He was under a duty to perform the conditions of the permit, or else see that they were performed. He incurred a duty that was non-delegable. Where a statute, or municipal ordinance requires one to do certain things, or to take certain precautions for the protection of the public, he cannot delegate such duty to another, even though such other person may sustain the relationship of independent contractor to him."

Terminating Employment

It does not pay to try to make the provisions of any contract too favorable. That may result in making the agreement terminable at the will of either party.

To illustrate, when plaintiff in a recent Louisiana case was given a contract as manager at a monthly salary of \$500, to continue as long as the employer should operate the business, he apparently thought he was getting a life job. But the Louisiana Supreme Court decided (139 So. 760) that the employment was for an indefinite term, especially since plaintiff could have quit any time. Therefore it could be terminated any time by either party. There must be mutuality of obligation under contracts, and the court said that it would not be fair to say that plaintiff could have quit any time without rendering himself liable to his employer, but that the employer was bound to employ him so long as he remained in business.

The court cites many decisions from other states to the effect that a contract to give "permanent" employment is so indefinite as to duration as to be terminable at the will of either party any time.

2 far-better-than-ordinary paving tools:

The HILL SURFACER

for wiping out the bumps in concrete and bituminous pavements

The HILL SURFACE TESTER

for detecting all surface irregularities

Write for details

THE H & H MANUFACTURING CO.
ELYRIA, OHIO

Illegal Contracts

A clause in a contract may look all right and yet be of no more substance than the central area of a doughnut. This is because an illegal agreement is no agreement at all in the eyes of the Law.

To illustrate, a Kentucky statute provides that the excess of the cost of paving above half the value of assessed property shall be paid out of the general funds of second-class cities. A paving contract provided that the contractor would exempt the city from this statutory liability.

The Kentucky Court of Appeals decided (Forbes v. City of Ashland, 55 S. W. 2d, 917) that the provision of the contract was void, because of its tendency to induce bidders for paving contracts to increase their bids to the disadvantage of owners of property not assessed in excess of half of its value.

Accordingly, the court ruled that the city was not exempted from liability in this case.

—for making BETTER concrete—

The MUNSELL VIBRATING SCREED BOARD

As you know, tests have proved conclusively that the use of any concrete vibrator allows a drier mix and results in a smoother finish. Now here is an improvement on all previous types of vibrators, which leaves a *particularly* smooth finish behind the screed board. You will want to know more about it! Write:

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GOOD ENGINEERING
AND GOOD PRODUCTS MAKE
GOOD ROADS



STANDARD CUT-BACK ASPHALT, SOCONY BRAND, ROAD MIX CONSTRUCTION, ROCK VALLEY ROAD, DELAWARE COUNTY, N. Y.



Standard Asphalt Road Oils
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Standard Asphalt Emulsion for Surface Treatment, Penetration, Road and Plant Mix, and Patching
Specifications and all other particulars furnished on request.

SOCONY-VACUUM OIL Co.
INCORPORATED
STANDARD OIL OF NEW YORK DIVISION

Top Like Pre-Mix Made by Road-Mix

(Continued from page 5)

tires. At the front of the machine, which is owned by Albany County, are two blades which pick up a strip 10 feet wide, turn the material over and deliver it in a single windrow at the center of the machine. Following these two inward delivery blades are two outward delivery blades which form a V plow, to turn the material over again in the reverse direction. Following the V plow is a third set of blades which duplicates the first set and turns the material inward again. At the rear of the third set of blades is a distributing gate or divider blade which can be swung from its rear pivot to move any part or all of the mixed windrow of material from one side to the other. Behind the divider blade is a small V plow which provides a mixing action and distributes the material to the rear leveling blade. The leveling blade has end gates which may be adjusted to spread the material any width from 8 to 11 feet.

The paver is operated by two men who are seated at the rear of the machine. One man adjusts the mixing blades and the other operates the distributing gate and leveling blade. The first operator also steers the rear wheels when necessary to hold the machine in line on banked curves. These steerable rear wheels also enable the operator to steer a straight course and get a good straight edge on the road, regardless of any off-line driving by the tractor operator.

Behavior of the Emulsion

The Colas asphalt emulsion showed a slight initial break soon after application, but the complete break did not occur for several hours. The portions of the mix exposed to air currents turned from brown to black in a few minutes, but deeper in the windrows of mixed material the brown color of unbroken emulsion showed for some time. Experience has shown that no loss of emulsion occurs from wash by rain provided it has been mixed into the aggregate by one passage of the mixing equipment. Run-off from rain storms may show some brown discoloration but examination shows that it contains little or no asphalt, no more than would have been carried off if any other type of binder had been used in the rain.

Unusual Feature

The unusual feature of the Green Island work is that it was so operated as to use a gradation of stone from $\frac{1}{8}$ inch to 1-inch, resulting in a much denser pavement than if one size of stone had been used, as is the case with most road-mix work. The usual trouble with segregation of sizes was overcome by first placing the coarse stone, applying and mixing in sufficient emulsion to coat it, then the coated mass was spread roughly and the finer sizes spread upon it. These finer sizes did not sift through or segregate, as the asphalt coating on the coarser sizes prevented it. The remainder of the emulsion was then applied and mixed and the final spreading and smoothing out completed, re-

sulting in a uniform mix much denser than the usual stone aggregate road-mix and looking much like a sheet asphalt pavement.

Personnel

The work described was done by relief forces with Leo Costello, Foreman in charge under the direction of the County Superintendent of Highways.

Winter Concreting

(Continued from page 9)

severe conditions. Care should be exercised to protect exposed portions of small or moderate mass and exterior vertical surfaces. Pilasters, especially at the base, lintels, buttresses and other exposed members, require extra protection and their own sources of heat in freezing weather. Don't skimp on heat. Remember adequate temperatures maintained for a full day are better than inadequate temperatures for several days. Guard against temperature drops, such as the low point before dawn and the unexpected change in weather.

Curing

Concrete has to be kept moist in order to cure in winter as well as in summer. If heat is supplied by wet steam, sufficient curing moisture is usually available. If dry heat such as salamanders are used, be careful to avoid drying out. Dried out concrete will not gain in strength as it should. If the air is dry, water should be applied to the concrete.

Chemicals or Accelerators

Salts to lower the freezing point and chemicals designed to raise temperatures are not recommended. Calcium chloride can be used to increase the rate of hardening, but should not exceed 2 per cent by weight of the cement.

Don't Take Chances

It pays to be on the safe side. Good concrete is the result of good management—not good luck!

SUPERIOR EARTH MOVING EQUIPMENT



Write
for
Catalog "B"

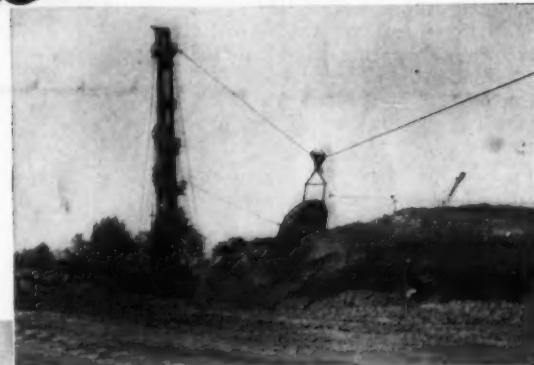
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WHEN IT'S A TOUGH JOB THEY USE *Williamsport*

Here's one of the largest Levee jobs on the Mississippi, measuring 400 ft. from toe to toe, 43 ft. deep and runs about 30,000 yards per 100-ft. station. The pit spans range from 600 to 900 ft. requiring 1150-ft. lengths of $1\frac{1}{2}$ " wire rope.

These great machines are 100% equipped with Williamsport Wire Rope, giving utmost satisfaction.



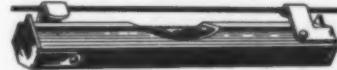
We emphasize the point that when it comes to large ropes, particularly, we suggest that you use Williamsport for best results.

Powers Construction Company feel this way about it because they have had unhappy ex-

periences with large ropes of other makes, and they have found Williamsport more uniform and more durable in the heavy going in which they are engaged.

Why not send your next inquiry to us and verify our claims?

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Crawler Wagons on Sky Line Drive

(Continued from page 1)

1½-yard Amsco buckets and a new Lorain 77 diesel shovel of the same size. The first two were started back to back at Jenkins Gap, Sta. 648, one working south and the other north, while the new shovel was started at the point where the trail crosses the grade about one-third of the way from the north end of the contract.

Handling the Dirt

The three shovels loaded to three 11-yard Euclid crawler wagons, two 7-yard Athey crawler wagons, and one 11-yard LaPlant-Choate wagon, all pulled by Caterpillar Fifty diesel tractors. The free haul on the contract is 1,000 feet with a unit price for overhaul from 1,000 to 2,000 feet, and another unit price for material hauled from 2,000 feet to one mile, all based on the station yard. The average haul on the job has run about 400 feet.

The through cuts have run from 500 to 12,000 yards with a maximum depth of 35 feet on the slope of sidehill cuts. The maximum length of the cuts has run about 400 feet for through cuts and 1,000 feet for sidehill cuts. The grade has been so designed that the cuts balance at the middle, making the haul very uniform. The grade is being completed and then there will be some borrow for the subgrade. The large number of boulders, stumps and loose rock have kept the shovels down to 1,000 yards of material moved a day. The clearing and grubbing crews ahead use dynamite to loosen the stumps which are thrown out by the shovel to the shoulder and later gathered by one of the tractors and bulldozed into piles for burning when the weather is propitious.

On the dumps a LaPlant-Choate trail builder and a Euclid bulldozer are used with the tractors for pushing the material over the end. The crawler wagons were all side-dump and were skillfully handled in close quarters by the tractor operators. In some places it was necessary for the tractor to climb the sidehill slope to get out of the way of the shovel while loading and then to back to the dump about 200 to 500 feet as there was no room to turn around. The grade was brought to shape and the ditches cut with an Austin-Western Mammoth Senior grader with a 10-foot blade pulled by one of the Caterpillar Fifty diesel tractors. In close quarters it was also

interesting to see the usefulness of the bulldozer used at the dump. The operator would clean the dump and then as the tractor and crawler wagon moved toward the dump the other tractor would maneuver to get close to the shovel and clean up the pit and the road for the hauling tractor. This made for faster operation in tight quarters and helped to maintain the equipment in better shape.

Hitting the Rock

The contractor worked two Ingersoll-Rand 370 and one 9 x 8 portable compressors furnishing air for the three I-R wagon drills and six I-R jack hammers. The wagon drills used 1½-inch steel up to 20 feet in length and the jack hammers some 1-inch hex and 1½-inch steel up to as long as 20 feet where it was impossible to get the wagon drills set up. Normally the maximum steel used with the jack hammers was 12 feet.

The granite in the section is very tough on the steel, it being impossible to get more than 1 foot of hole per steel without resharpening. On the jack ham-



C. & E. M. Photo
Wagon Drill Working, and Service Truck Unloading Culvert Pipe

mers two men were used to get all the "push" possible to the blow of the drill. At the blacksmith shop near the camp the contractor installed an I-R 40 sharpener and oil forge. The steel was all handled by truck. The Ford truck for this service was known as the "gin" truck, showing the background of cotton

gin experience somewhere in the organization. This truck handled, in addition to the steel, everything else needed to be moved except gas and oil. Another Ford with a 350-gallon tank carried gasoline to the shovels and tractors and fuel oil to the diesel shovel.

(Continued on page 17)

NATIONAL CARBIDE V-G LIGHTS

For Profits on Any Job—

At Night

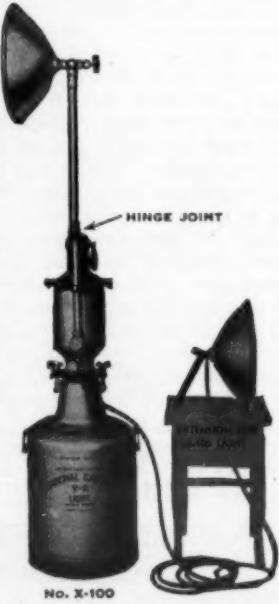
Winter Work means SHORT DAYS and LONG NIGHTS with a need for economical light.



THE NATIONAL CARBIDE V-G LIGHT (illustrated at right) spreads a full, even beam of about 8000 candlepower right where you need it, giving ample clear, steady light for about twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Weighing 35 pounds empty, 98 pounds when full, it is easily handled by one man. No harm done if it tips over:—simply stand it up again, and it goes right on working. The reflector standpipe may be tilted to any angle.

THE NATIONAL CARBIDE V-G HANDY LIGHT illustrated at the left is a smaller size, consisting of a tank holding 2 gallons of water, a hopper containing a 1½-pound charge of National 14-ND Carbide and the feeding device. It runs for about five and one-half hours on one charge, and delivers about 1500 candlepower. Weighing only 37 pounds when charged, it is a most handy light for emergencies because it is so easily carried around. Reflector tilts to any angle.

THE NATIONAL CARBIDE LANTERN (at left) is the nearest approach to daylight ever found in a lantern—giving ten times more light than an oil lantern, and at less cost. It burns eight hours on a single 8-ounce charge of carbide and one filling of the water chamber. A brilliant rear signal of red, blue or green is supplied without extra cost.



NATIONAL CARBIDE SALES CORP.
LINCOLN BUILDING
NEW YORK

A Four-Year Record of Employment

(Continued from page 1)

First Emergency Funds

To meet this situation, Congress on December 20, 1930 appropriated \$80,000,000 to be advanced to the States and used by them in lieu of their own funds in matching the regular Federal-Aid apportionments.

At the time this appropriation was made the country was facing the certainty of its first serious condition of unemployment. It was realized that an unprecedented number of men would be out of work during the coming winter, but it was thought that if means could be found to relieve the winter situation, the normal upturn of business in the spring could be counted upon to restore to employment rolls all those temporarily out of work.

Consequently Congress made the \$80,000,000 it appropriated available for expenditure only until September 1 of the following year, expecting by so doing to force a considerable expenditure during the winter and spring months. Also, it provided that the money advanced should be returned by the States over a period of five years beginning in 1933, by deduction from the Federal-Aid apportionments to the States for that period.

This first emergency appropriation had substantially the intended effect. Within a very small margin it was entirely expended by the terminal date set; and, as the accompanying monthly employment table shows (Table 1), it materially increased the number of men employed during the ensuing six months.

Second Federal Advance

After this effort no similar action was taken by the Federal Government until July, 1932 when, in the Emergency Relief and Construction Act, it again provided an emergency advance, this time in the amount of \$120,000,000 to be expended before June 30, 1933 and repaid by deduction from future Federal-Aid authorizations in ten installments beginning in 1938.

By reference again to Table 1, it will be seen that, after the stimulation of the first emergency advance, construction employment during the first part of 1932 had again fallen off, and that this trend was arrested and quickly turned by the new advance, the effects of which are evident as early as September of that year.

At this point it should be explained that the two emergency appropriations were intended to meet what was believed at the time would be a quickly passing difficulty of the States in matching Federal authorizations; hence the limited term of expenditure and the requirement of repayment by deduction from future Federal-Aid apportionments.

Recovery Act Funds

A clearer recognition of the depth of the depression is indicated by the outright grant of \$400,000,000 by the National Industrial Recovery Act, which next provided for road work; and a similar view is evident in the terms of the most recent act, approved June 18, 1934, which not only provided a further outright grant of \$200,000,000, but also cancelled the repayment obligations created by the two emergency appropriations.

A further reference to Table 1 shows that the employment effects of the first outright grant were first felt in September, 1933, and since that month have been evident in greatly increased numbers of men employed on the Federal and Federal-Aid work. In the first ten months of 1934 the average employment

(Continued on page 27)

Table 1—Average Number of Men Employed on Federal and State Highway Work

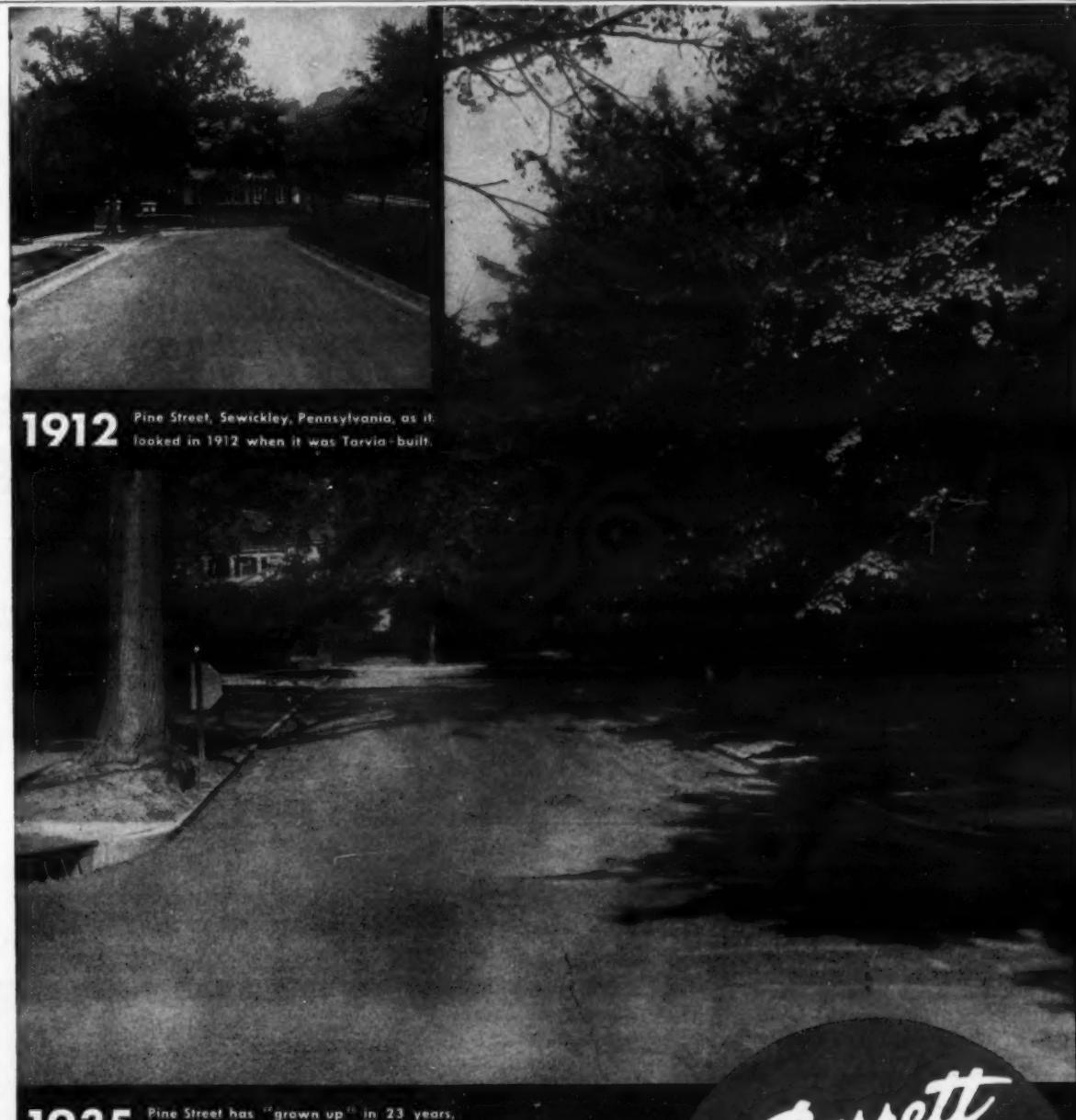
MONTH	CONSTRUCTION WORK								STATE MAINTENANCE WORK				TOTAL			
	FEDERAL AND FEDERAL-AID				STATE				STATE MAINTENANCE WORK				TOTAL			
	1931	1932	1933	1934	1931	1932	1933	1934	1931	1932	1933	1934	1931	1932	1933	1934
January	31,279	29,518	75,498	154,154	48,621	58,590	39,906	25,345	68,700	141,081	151,039	136,490	148,600	229,189	266,443	315,989
February	37,587	26,673	78,215	156,814	53,787	53,607	36,352	22,311	80,186	137,938	140,689	126,965	171,560	218,218	255,256	306,090
March	54,852	28,008	95,704	144,053	58,701	50,699	37,891	19,985	91,334	132,842	145,618	132,227	204,887	211,549	279,213	296,265
April	97,560	42,205	122,256	187,657	72,212	60,056	40,560	21,510	93,732	141,582	137,066	136,111	263,504	245,843	299,882	345,278
May	126,715	59,008	139,831	271,972	89,764	70,834	47,540	27,161	94,452	129,773	142,767	167,371	310,931	259,615	330,138	466,504
June	154,515	71,772	152,276	336,414	101,273	79,845	54,388	37,642	107,692	129,019	152,941	170,957	363,482	280,636	359,605	545,013
July	164,708	81,042	129,205	335,223	112,638	94,212	61,428	45,478	108,003	130,118	141,644	168,502	385,349	305,372	332,277	549,203
August	151,418	89,346	111,211	297,224	121,172	92,855	60,365	53,540	117,359	151,202	158,237	180,270	389,949	333,403	329,813	531,034
September	116,100	122,193	115,047	247,880	123,404	97,084	62,366	61,865	117,113	155,128	160,560	188,406	356,617	374,405	337,973	496,151
October	88,869	124,106	154,016	210,079	116,752	90,321	58,711	71,008	124,483	158,819	171,302	169,235	330,104	373,246	384,029	450,322
November	62,466	129,933	174,358	—	103,198	81,006	46,810	—	123,652	160,728	140,863	—	289,316	371,667	362,031	—
December	35,991	98,271	154,154	—	74,543	52,208	25,345	—	134,437	139,986	136,490	—	244,971	290,465	315,989	—
Monthly Average	93,505	75,173	125,148	234,147	89,672	73,610	47,638	38,585	105,095	142,351	148,268	157,653	288,273	291,134	321,056	430,385

Table 2.—Average Equivalent Employment on Federal and State Highway Work by Years from 1931 to 1934, Inclusive

Year	CONSTRUCTION WORK				STATE MAINTENANCE WORK				TOTAL		
	Federal and Federal-aid	State	Average Number of Men	Percent of Total	Average Number of Men	Percent of Total	Average Number of Men	Percent of Total	Average Number of Men	Percent of Total	Average Number of Men
1931	93,000	—	32,3	32.3	89,672	—	31,2	31.2	105,095	—	36,5
1932	64,000	—	22,8	22.8	73,610	—	26,3	26.3	142,351	—	50,9
1933	73,700	—	27,3	27.3	47,638	—	17.7	17.7	148,268	—	55,0
1934*	119,800	—	39.0	39.0	30,000	—	9.8	9.8	157,653	—	51.2

(Actual employment converted to uniform basis of 180 hours per man-month)

*To October inclusive



1912

Pine Street, Sewickley, Pennsylvania, as it looked in 1912 when it was Tarvia-built.

The Barrett Company Tarvia organization, with its 31 years of successful experience in low-cost road-building, offers practical, money-saving cooperation to road officials, particularly those whose 1935 budgets are limited. Before completing your plans, talk them over with a Tarvia field man. He can show you how to meet immediate and future needs inexpensively — how to get the most miles of smooth, easy-riding, skid-safe road . . . Meet us at Booth 34 Annual Meeting of American Road Builders Association, Willard Hotel, Washington, D.C., January 22-24, 1935.

THE BARRETT COMPANY New York Chicago Philadelphia Birmingham St. Louis Rochester Toledo Milwaukee Detroit Baltimore Youngstown Cincinnati Buffalo Minneapolis Syracuse Bethlehem Providence Cleveland Hartford Portland, Me. Lebanon Columbus Boston In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver



Fast Paving with Truck Mixers

(Continued from page 8)

concrete paving contract. When 4,500 feet of 10-foot slab is poured in 12 hours there is no evidence that the contractor is losing on that particular operation. But there must be team work to make that possible. On the more common concrete projects, the flock of batch trucks must operate in proper swing with the paver, there must not be too many or the contractor will lose on that item, nor must there be too few lest the paver be held back in pouring the "money-maker" of the job. On the work under discussion there were practically six pavers and one machine to which they delivered the mixed concrete. Thus the handling of the delivery of the concrete by the truck mixers to the Jaeger single-screw spreader was most important.

Each truck driver pulled up alongside the spreader as soon as the one ahead had delivered its entire load. The mixer dumper was a most important individual and one who had to be active the entire time he was on duty. He climbed onto the platform of the truck mixer, spun the wheel that released the mixer gate and opened or closed it as required to deliver the concrete at just the proper speed for the spreader.

The spreader operator had to work in harmony with the truck man so that there would be no piling up of the concrete over the screw of the spreader. Two simple devices aided these operations. First, the chute which caught the concrete from the truck mixer was about 5 feet wide so that any slight speeding up or lagging of the truck did not cause any spilling of the concrete on the grade outside of the forms. Secondly, there was a telltale on the spreader to show the various truck drivers where to spot the trucks. It consisted of a wooden pole attached to the spreader and extending several feet ahead of the spreader frame. On it were two uprights which were the indicators for the truck drivers. Evidently there had been some good-natured "kidding" on the job as the uprights had not only the numbers of the trucks which were to stop at each of the telltales but such a comment, written in blue pencil, as, "For Bilbo the Blind Man." That truck driver never forgot where to spot his truck after that!

As the concrete poured into the chute, the spreader operator watched the grade as well as the amount of concrete in the spreader. He carried a uniform load of concrete across the screw to the far side by starting and stopping the screw as needed, and also watched the grade to see that he was progressing forward fast enough to give a uniform depth of concrete. Careful operation on the part of each operator and that everlasting invaluable ingredient of construction

that makes the job click, team work, made possible the constant high average production. There were but three men in the concreting crew on the road, the truck mixer dumper, the spreader operator, and a helper. The usual group of two to four puddlers was not needed.

Mechanical Finishing

Immediately behind the spreader was an Ord finisher with the operator and a helper who watched the speed of the machine and shoveled to the screed when necessary. The second Ord followed from 50 to 75 feet behind the first and completed the production of a smooth compact surface. There were also two men with the second machine.

Hand Finishing

There were five hand finishers, two head men and three helpers. They first used a 10-foot drag straight-edge followed up with a 5 x 1-foot long-handled float for touching up spots, and also the "sleeve-board" finishing floats which

(Continued on page 22)

New Diesel Forty Tractor

The diesel Forty tractor, recently announced by Caterpillar Tractor Co., Peoria, Ill., brings greater power, increased strength and the outstanding operating economy of the diesel engine to a long list of tractor jobs. Its 3-cylinder diesel engine develops 44-horsepower at the drawbar and 49-horsepower on the belt. According to the manufacturer, the power of the engine is balanced by the strength of the machine itself. The track assembly and track frame feature the same rugged construction found in the largest Caterpillar models, including cast steel diagonal braces, enclosed recoil springs, double front idlers and heavier track links of improved design.

This combination of increased power and strength means ability to handle bigger loads in all four working speeds. The diesel Forty is built to pull a 6 to 8-yard wagon or a 7 to 8 bottom plow under most conditions. The frame is

drilled for mounting such equipment as bulldozers, trailbuilders, hoists and side booms. Wide gage models and a wide variety of track equipment are available.

Turn Waste Into Profit with a SKINNER Stream-Line FILTER



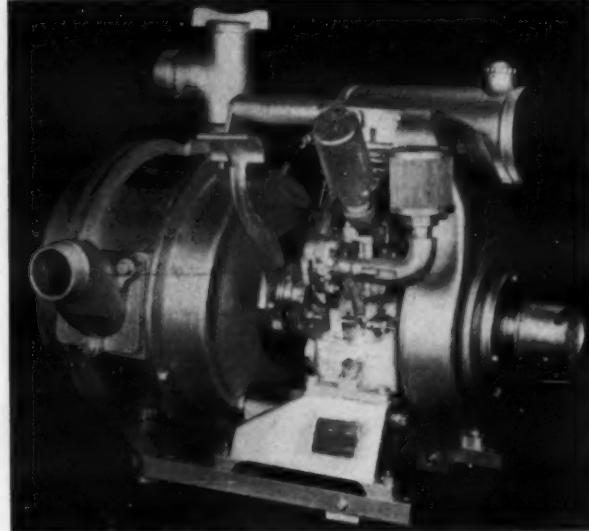
All lubricating oils now drained from your trucks, tractors, etc., and discarded as useless, may be thoroughly purified of all injurious contaminations with Skinner Stream-Line Purifying Equipment. The oil recovered in this manner is a clean, full-bodied product, equal in lubricating value to your new oil in service.

Send for our illustrated circular on converting present waste into profit.

There are two desirable territories open for the right men.

SKINNER MOTORS, Inc.
2231 Dalzell St., Detroit, Mich.

The biggest pump news in years! for contractors—public utilities—municipalities—marine companies

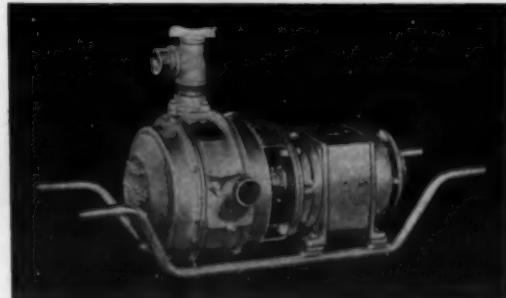


NEW 2" MARLOW SELF-PRIMING CENTRIFUGAL PUMP

Actual capacity up to 120 g.p.m. Suction lifts up to 25 feet, Self-priming. No foot valve. Total weight 98 pounds

Features of this pump worth your special attention:

- Easily carried by one man
- 100% automatic, self-priming
- No handles or pet cocks to be adjusted
- Four-cycle engine with oil reservoir in crankcase
- Easy to start—Speed control—Air cleaner
- Foot and rope starters—Self-oiling
- Engine has only one place requiring lubrication



An electrically driven explosion-proof unit for use on oil barges or in other dangerous places



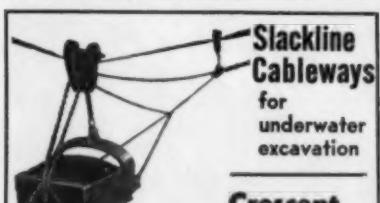
Showing the unit pumping out a flooded cellar

Other sizes up to 8"

Ask for Specification Sheet 20A

Manufactured by

MARLOW PUMPS
Ridgewood, New Jersey



Slackline Cableways
for underwater excavation

Crescent Scrapers
for long range dirtmoving

SAUERMAN BROS., Inc.
444 S. Clinton St., Chicago
Operated by One Man. Capacity: 10 to 600 cu. yd. per hour.

WRITE FOR CATALOG

Tractor Drove Piles At 45-Degree Angles At Fort Peck Dam Site

A Cletrac tractor is shown in the illustration pushing heavy timbers into the banks of the river at Fort Peck Dam as the foundation for a landing—in other words it is doing pile driving at 45 degrees instead of vertically. The large bumper shown on the front of the machine is being used to skid the large generators and heavy machinery on the dredges after the material has been hauled to the shell of the boat in the river. Few folks realize that the Fort Peck Dam is more than eight times larger than the present record holder. It will require 90,000,000 cubic yards of earth fill and will impound 20,000,000 acre-feet of water.

The primary purpose of the Fort Peck Project is the improvement of navigation. A second purpose is flood control and the prevention of destructive soil erosion, while the third purpose is the production of electrical power and a fourth is irrigation. It is being constructed at this time from PWA funds to provide jobs for the unemployed. It is approximately one year since the first contingent of seventy men began clearing the dam site, and there are now over 7,000 directly employed on construction.

The lake formed will have an approximate shoreline of 2,500 miles, a maximum width of 16 miles, a length of 175 miles, an area of 250,000 acres, a storage capacity of about 20,000,000 acre-feet with a maximum depth of 230 feet. If all the water in the reservoir were spread out evenly over the state of Montana, the depth would be nearly 2½ inches, or if it were spread out over the state of Connecticut it would be 6½ feet deep.

Bituminous Road Costs in Minnesota in 1934

On 143 miles of typical bituminous roads completed by the Minnesota State Highway Department in 1934, the average total cost was \$6,330 a mile. This cost includes all base preparation work, such as gravel or sand lifts, as well as the bituminous wearing surface. The average cost of the wearing surface was \$4,270 a mile. The average cost of base preparation was \$2,060 a mile. According to N. W. Elsberg, Highway Commissioner, these figures are typical of the department's bituminous construction program. Maintenance of bituminous treatments, a number of which are now in progress, cost generally from \$1,000 to \$2,000 a mile.

On a 20.42-mile bituminous construction job on State Highway 61 from Lutzen to Grand Marais, the total cost, including subgrade corrections, wearing course and shoulder treatment, was



Unusual Pile Driving Method at Fort Peck Dam

\$141,313.77 or \$6,920.36 per mile or \$4,356.38 per mile of surface course only. Similar figures for a 7.9-mile project on State Highway 71 from Long Prairie south are; total cost, \$33,950, or \$4,297.47 per mile, or \$3,978.57 per mile of surface course only. Similar costs on a 12.94-mile project on State Highway 23 from Cold Springs to Waite Park are \$103,168.81 or \$7,967.94 per mile or \$7,373.40 per mile of surface course only. On this project the use of crushed granite added to the cost.

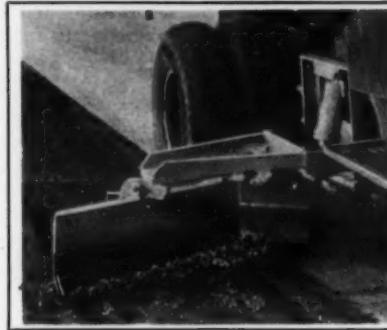
County Maintenance Costs

(Photo on page 36)

The economy of diesel power is demonstrated by some interesting figures on the cost of road maintenance recently offered by Turner County, South Dakota. This County owns two road maintenance machines, both of which are Caterpillar Auto-Patrols, but one is powered with a diesel engine and the

other with a gasoline engine.

During September, 1934, both machines were operated on the same kind of work and an accurate record of costs was kept. The diesel machine consumed 416 gallons of fuel oil, costing \$34.34, while the other unit burned 643 gallons of gasoline costing \$89.46. The average cost per mile of road maintained was 20 cents for the diesel and 28.5 cents for the gasoline machine.



The BURCH SIDE-O-TRUK SHOULDER MAINTAINER

Cuts 75% from the cost of working road shoulders—completing the job in one operation.

Write for circulars on this and other BURCH equipment: Undr-Truk Road Maintainers, Stone and Asphalt Spreaders, Trench Fillers, Crack Fillers, Portable Conveyors, Snow Plows, etc.

THE BURCH CORPORATION
CRESTLINE, OHIO

How the COMET DIESEL Burns its Fuel



Ignition Begins



Ignition Progresses



Full Combustion

Every Diesel engine employs the heat of compression for ignition. When a relatively large volume of air is compressed into a small enough space, its temperature becomes higher than the ignition temperature of the fuel. While the air is still in this state, fuel oil sprayed into it combines with the oxygen . . . ignition takes place, and the fuel burns.

When this occurs in the Comet Diesel combustion chamber, the air is in high turbulence at a temperature well above the ignition point of the fuel oil. The fuel ignites promptly as it is atomized and is carried by the air swirl to all parts of the chamber. The air moving at whirlwind velocity aids atomization as well as combustion. The accumulation of appreciable

quantities in dead pockets is prevented and each fresh atom of fuel is exposed to a fresh supply of oxygen. As a result, the last particle injected burns as promptly and completely as the first. This is the basic requirement for smooth engine operation.

The speed of combustion in the Comet combustion chamber is an inherent function of the engine speed, and is increased by the increased turbulence whenever the engine speed itself increases. Unique in this respect, the Comet type Diesel is ideal for automotive service

which demands a wide range in speed and load performance.

Write for Bulletin 957—it gives complete details. Waukesha Motor Company, Waukesha, Wisconsin.



THIS IS NO. 2 OF A SERIES on the Comet Diesel. No. 3 will appear next month. A reprint of the complete series will be mailed on request.



WAUKESHA ENGINES

CONSTRUCTION EQUIPMENT

McKERNAN-TERRY
Pile Hammers, Pile Extractors

LAMBERT-NATIONAL
Hoists, Derricks, Cableways and Whirlers

STEELE & CONDICT
Special Machinery, Movable Bridge Machinery

Write for descriptive catalogs

McKiernan-Terry Corp.
19 Park Row, New York
Distributors in Principal Cities

Banish Grade Crossings Through PWA Program

Existing plans, wide distribution, and increase in safety to motor and railway travel make grade crossing elimination an ideal project for overcoming unemployment this winter and spring. Work could be started tomorrow because plans are already drawn up for the elimination of thousands of grade crossings which cannot be financed at present by railroads or state funds.

There are 240,000 highway crossings with rail lines at grade and not over 30,000 of these are protected by watchmen, gates, or similar means. There are many more dangerous grade crossings between vehicular highways that also might advantageously be eliminated. Although the railroads have removed thousands of grade crossings in recent years, the total number today is higher than at any time in our history. This is because of the great number of new roads and highways that have been built within the last ten years.

A Worth-While Investment

To remove all the grade crossings of highways with railways would entail about \$2,400,000,000. Such an investment in the highways of the country would repay the public many times in savings in life and property. In the present national emergency \$1,400,000,000 might well be set aside from the Public Works Appropriations for these specific projects. Such a sum would provide 9,000,000 man-months work, which is another way of saying that it would provide a year's employment for 750,500 workers directly and many more thousands indirectly. V. G. Iden, Secretary, American Institute of Steel Construction also points out,

"The elimination of all grade crossings on existing highways would almost eliminate the cause of traffic accidents. This program should, therefore, be considered from the humane viewpoint as well as the economic."

Proper Lubrication Made Long Engine Run Possible

The part that proper lubrication plays in the life of a gas engine was demonstrated effectively at Radio City, New York, recently. During the excavation of an area of 112,000 square feet for the foundations of the new Italian, Czech-Slovakian buildings, the George J. Atwill Foundation Corp. of New York City used an Ingersoll-Rand air compressor driven by a gas engine which had been in steady use for three years on previous work at Radio City in the excavating of the R.C.A. Building, and also on track elimination for the West Side improvement of the New York Central Railroad in New York City. The chief function of the unit was to furnish compressed air for the operation of pneumatic rock drills, and for driving pile hammers.

George S. Kelley, mechanical engineer for George J. Atwill Foundation Corp., decided in September that it was high time to overhaul thoroughly the engine and compressor. He estimated the work to cost about \$175, covering a reboring job for the cylinders and replacement of the pistons, wrist pins and rings.

Little Wear

Actual tests showed a variation of less than 3/1000 of 1 inch in the cylinders, and the crank and wrist pins were in such condition that no changes whatsoever were necessary. Only the top rings actually needed replacement. The condition of the compressor showed that no adjustments or replacements were necessary. The total cost of materials to put the engine and compressor in A-1 order was only \$19.80.

In discussing this remarkable record Mr. Kelley said, "The results of these

tests pay a real tribute to the lubricating job done by Socony-Vacuum lubricating oil during the past three years. The engine and compressor, which have been operating on the average of 50 hours a week during this period, have presented one of the toughest lubricating jobs possible. By carefully changing the oil every five days, the proper film has been maintained throughout, preventing even normal wear on the crankcase, bearings and other moving parts." Mr. Kelley estimated that over 110,000 gallons of Socony gasoline has been consumed during this period by the engine.

Distributor Changes Address

W. T. Walsh Equipment Co., equipment distributor of Cleveland, Ohio, has announced a change of address from 12500 Berea Road to 3088 West 106th Street, Cleveland. This company handles a number of well-known lines of road building and construction equipment.

Picks and Shovels

(Continued from page 1)

roads. The activity of this black gang would have served as the perfect slow-motion picture of a crew of men at work. The group slowly and rhythmically swung picks into the ground, in a vain attempt to do what one of our scarifiers would have accomplished far more successfully in much less time. An antiquated and battered road roller, which belonged in a museum rather than on the road, chugged slowly back and forth, displaying little or no purpose in its gyrations. The presence of a stranger with a camera was sufficient reason to halt all operations and pose, in the hope of "having one's picture taken."

To Our Road Builders!

Amusing as these experiences were, they succeeded in impressing upon my

mind the blessings we have in our excellent roads (and also our great obligation to keep them so), and I tossed in the air a figurative hat for the men who have made them possible—the engineers of the state highway departments whose high standards of design and inspection have developed our system of highways, the manufacturers of road building equipment whose modern methods and efficiency have put into the hands of our road builders the ways and means to provide good roads, and the contractors whose sincerity of purpose and pride in their work have used this equipment to the best possible advantage.

WATERWORKS-PUMP HOUSE MACHINERY for SALE

The Village of Irvington is dismantling the old water works pump house on Harriman Road and invites bids for the equipment.

Information may be obtained by applying to Thomas J. Gorey, Village Clerk Town Hall, Irvington, N.Y. Phone Irvington 1570



The Colonial Construction Co., of Spokane, Washington, uses "Caterpillar" Diesel power in the construction of a new scenic highway in Rainier National Park.

On a fuel cost of less than a dollar a day, Amador County does road maintenance work with this "Caterpillar" Diesel Tractor near Jackson, California.



"THE 'CATERPILLAR' DIESEL TRACTOR HAS CUT OUR FUEL COSTS 70%"

—SAYS A COUNTY SUPERVISOR WHOSE ROAD WORK WAS FORMERLY DONE WITH A GASOLINE TRACTOR. OTHER OWNERS, EVERYWHERE, REPORT SIMILAR SAVINGS

"It costs only half as much to fill the fuel tank, and a tankful lasts twice as long"—"Fuel for our tractor costs less than food for the driver"—"Our big 'Caterpillar' Diesel costs less for fuel than three smaller gasoline tractors" . . . these are terms in which owners express their delight over the economy of the "Caterpillar" Diesel. For their economy—plus rugged power, sure traction and faithful performance—"Caterpillar" Diesel Tractors have won a foremost place on today's earth-moving, contracting, road-building jobs. They can reduce your power costs. Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

AMERICA GOES DIESEL

Sky Line Drive

(Continued from page 12)

One powder and dynamite magazine was set up on the job and guarded zealously. The contractor used both 40 and 60 per cent gelatin du Pont and Hercules dynamite which broke up the rock into very satisfactory sizes for easy handling with the shovels.

Drainage Structures

Drainage on the entire project was taken care of by 6 and 10-inch vitrified tile pipe, laid where there were springs in the subgrade, 18 to 36-inch corrugated Armco pipe for culverts and one concrete box culvert 4 x 5 feet in section. For handling the concrete for the culvert the contractor moved in a single Jaeger 2-bag mixer, a Jaeger pump to furnish water for the concrete from a small spring near by, and a set of Winslow wheelbarrow scales for batching the aggregates. The stone, sand and cement were hauled in by one of the two International dump trucks which also helped out on hauling from the shovels when extra distance was necessary and the roadway was in fairly good condition. At the culvert which was on a considerable slope the contractor built a runway along one side with the mixer set above it at the upper end so that the loaded concrete buggies could be run down hill and the empties pulled up grade.

Lubrication

Among the important structures at the camp site was the grease house where the drums of lubricants for the tractors, trucks, crawler wagons and compressors were stored handy for immediate use without any delays. Mobil-oil lubricants were used throughout the work. The crankcase oil of the tractors and shovels was changed once a week after 60 hours service. The shovels and tractors as well as the crawlers of the wagons were greased daily, while the other lubrication was done once a week and included the changing of the filters in all the equipment.

Quantities

Clearing and grubbing	85 acres
Unclassified excavation	338,000 cubic yards
Unclassified borrow	10,000 cubic yards
Structural excavation	9,000 cubic yards
Overhaul	57,000 station-yards
Overhaul	10,000 miles-yards
Crushed stone base	36,500 tons
Cement rubble masonry	3,350 cubic yards
Dry rubble masonry	500 cubic yards
Grouted rubble gutter	2,000 cubic yards

Producing Surfacing Stone

Sammons-Robertson are required by the terms of the contract to produce the stone for the surfacing from quarries on the right-of-way or selected within the park area. An 18 x 36-inch jaw crusher was set up last fall so that the stone could be quarried during the winter and be stockpiled for spreading in the spring. A reduction crusher was also installed for producing the smaller stone for choking and sealing.

A Large Camp

A large camp of wooden buildings

Seasonal Greetings To You

THE Flexible Road Joint Machine Company and The Heltzel Steel Form & Iron Company thank you one and all for courtesies shown us in the past, and in return we wish you a Happy and Prosperous New Year.

Flexible Road Joint Machine Company
The Heltzel Steel Form & Iron Co.
Warren, Ohio

was set up at about the middle of the section, consisting of twelve buildings for office and storehouse or commissary, living quarters and mess hall. The camp was located on a plateau at Elev. 2,000 giving a fine summer camp. The winter will prove slightly different, but the buildings are well insulated and provided with gasoline stoves. A nearby spring provides adequate water for all purposes. Close by the camp are the blacksmith shop and the grease house, completing this temporary city in the hills.

Labor and Working Hours

There are 115 men working on this contract on an average for the two shifts. At the beginning of the work in June the hours were two 7½-hour shifts a day, but this was cut to 6½ hours a shift when the daylight began to shorten. Around September 10 this was further cut to two 6-hour shifts.

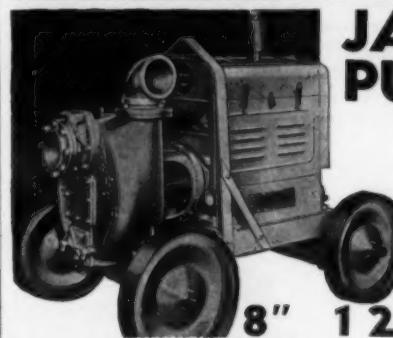
Skilled labor works 40 hours a week and common labor 30 hours and the contract requires that no operator or

laborer, except the superintendent and general foremen, can be worked more than 8 hours in one day.

Personnel

The contract for the construction of Project 2B of the Shenandoah National Park financed from PWA funds was awarded to Sammons-Robertson Co., Inc. of Huntington, W. Va., for \$363,893.00. For the contractor the work is under the direction of F. C. Sammons,

President-General Manager of the contracting organization with Lee Henry as Superintendent. All stone work for retaining walls was subbed to Robert Zando of Williamson, W. Va. The entire Shenandoah National Park highway project is in charge of William M. Austin, Highway Engineer, U.S. Bureau of Public Roads, with A. C. Haygard as Resident Engineer in charge of the three sections now under construction between U.S. 211 and Front Royal, Va.



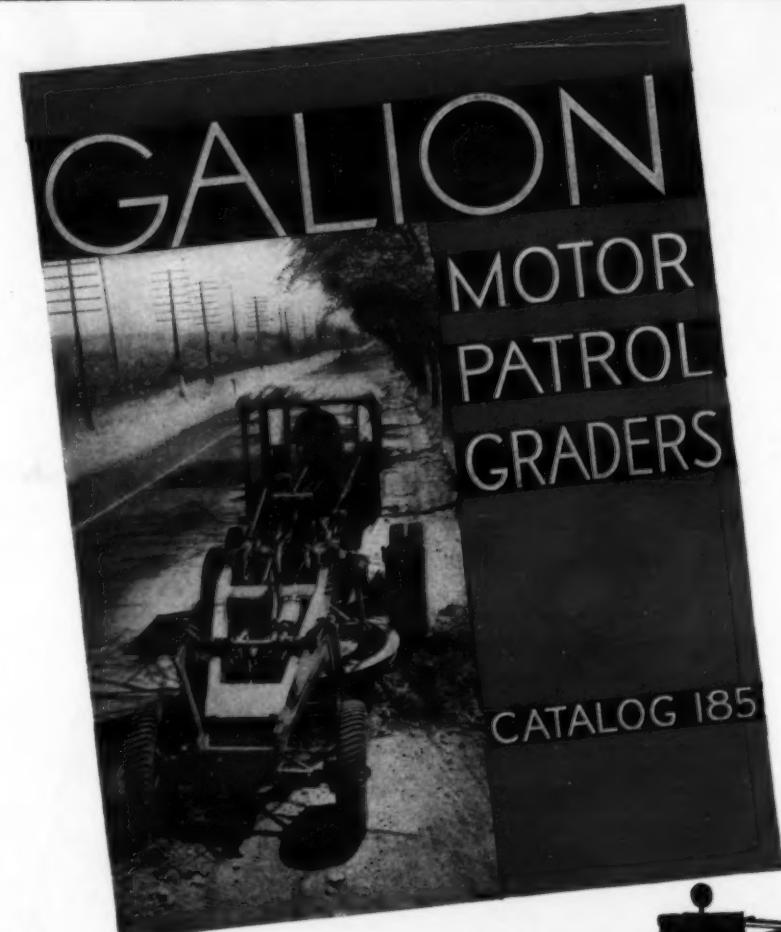
JAEGER Automatic PUMPS

- Prime Faster
- Pump More Water
- Pump More Hours

2", 3", 4", 6", 8" sizes. Capacities 10,000 to 125,000 g.p.h.

Our catalog P-34 gives full details. Write for it.

THE JAEGER MACHINE CO.
701 Dublin Ave., Columbus, Ohio
8" 125,000 G. P. H.



You Can Find the Answer...

to your Road Maintenance problems in the 24 pages of this New Galion Motor Grader Catalog. It explains fully why Galion Motor Patrol Graders are the smoothest cutting and the easiest operating graders to be had anywhere . . . at any price.

Tested and proved under every condition, Galion Motor Graders will easily solve your road maintenance problems . . . will do the job at the lowest possible cost and with the greatest efficiency.

Send for your copy of this New Galion Catalog No. 185. Write your nearest Galion Distributor . . . there is one near you . . . or simply write direct to



THE GALION IRON WORKS & MFG. CO.
GALION

DISTRIBUTORS IN PRINCIPAL CITIES

Rollers - Graders - Spreaders - Drags - Rooters

All Exhibit Space Sold For ARBA Convention

Unusual interest has been shown this year in the Highway Exhibit which is to occupy the entire top floor of the Willard Hotel in Washington, D.C., where the American Road Builders' Association is holding its Thirty-Second Annual Convention, January 22-25.

The exhibitors include: J. D. Adams Co.; Aeroil Burner Co., Inc.; American Casting Co.; American City Magazine; American Concrete Expansion Joint Co.; American Manganese Steel Co.; Armco Culvert Manufacturers Assn.; Austin-Western Road Machinery Co.; Barber Asphalt Co.; Barrett Co.; Black & Decker Mfg. Co.; Blaw-Knox Co.; Buda Co.; Buffalo-Springfield Roller Co.

Calcium Chloride Assn.; Philip Carey Co.; J. I. Case Co.; Caterpillar Tractor Co.; Cleaver-Brooks Co.; Cleveland Tractor Co.; Concrete Surfacing Machinery Co.; Continental Roll & Steel Foundry Co.; CONTRACTORS AND ENGINEERS MONTHLY; D. A. Lubricant Co.; Engineering News-Record; E. D. Etnyre & Co.; Evans Products Co.; Foote Co.; Four Wheel Drive Auto Co.; Fuller Co.; General Motors Truck Corp.; Heltzel Steel Form & Iron Co.; Hercules Motors Corp.; Highway Steel Products; Frank G. Hough Co.; Hug Co.; Chas. Hvass & Co., Inc.; Hyatt Roller Bearing Co.

International Harvester Co.; Iowa Mfg. Co.; Jaeger Machine Co.; Kalman Steel Co.; Kinney Mfg. Co.; Koppers Products Co.; Macaspalt Corp. of America; Medusa Portland Cement Co.; National Carbide Sales Corp.; National Paving Brick Assn.; Osgood Co.; Portland Cement Assn.; Public Works; Ransome Concrete Machinery Co.; Roads and Streets; Scintilla Magneto Co.; Signal Service Corp.; Solvay Sales Corp.; Timken Roller Bearing Co.; Toncan Culvert Manufacturers Assn.; Trackson Co.; Truscon Steel Co.; Tuthill Spring Co.; Universal Atlas Cement Co.; Universal Crusher Co.; Walter Motor Truck Co.; Waukesha Motor Co.; Wisconsin Motor Corp.; Gar Wood Industries, Inc.

Abrams Aerial Survey Corp.; Barco Mfg. Co.; Chain Belt Co.; Eaton Mfg. Co.; Hetherington & Berner, Inc.; Lufkin Rule Co.; Tinius Olsen Testing Machine Co.; Richmond Screw Anchor Co.

New Black-Top Paver Is Self-Propelling

Claiming that the new 1935 model black-top road builder will lay bituminous pavements with a smooth, fine riding surface without the use of road forms, the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, announces that the machine will handle 400 to 1,000 tons of material per day, and is adjustable for widths from 9 to 15 feet. Material is received in a hopper from a dump truck which the paver pushes forward at the speed with which the spreader screw distributes the material.

Instead of side forms, the machine uses the 18-foot long straight-edge runners which are full floating and carry the screed only. All other weight of the machine and the road material is carried on four rubber-tired wheels. There is no weight of the machine placed on the new road surface as the runners and wheels operate on the old road or subgrade and only the screed and blender screeds at the rear touch the newly laid material. The runners can be lifted in two seconds, by power, for maneuvering.

The screed has a saw-tooth front edge which oscillates, is tilted for compaction, and can be set for any specified crown and thickness of spread from 1-inch to 6 inches and runs to any grade wire or marker. The screed can be run with one end below the runners and the



The 1935 Jaeger Black-Top Paver

other end 7 inches above the runners. The telescopic frame permits adjustments from 9 feet to 15 feet by addition of change parts. The blender screeds, at the rear of both runners, ad-

justs laterally for spreading bled-back material to any additional widths up to 12 inches on either side, which is 6 inches outside the runner. The ability to lay 15-foot strips makes it possible to spread a 30-foot road in two trips.

A power-driven screw and heater help to break up lumps in the material. The reversible screw which spreads laterally allows the operator to spread material where desired. The machine is of automotive construction throughout with a 32-hp engine, has heat-treated gears running in oil, built-in-differential for easy steering, banked controls and variable speeds forward of 12 to 25 feet per minute and up to 120 feet per minute in reverse.

New Manager for Culvert Co.

Paul W. Gregory has recently been appointed General Manager of the Canton Culvert Co., Canton, Ohio, subsidiary of Republic Steel Corp., according to an announcement by N. J. Clarke, Vice President in charge of sales of the parent organization.

Mr. Gregory succeeds F. A. Kelly who was recently appointed President of the Toncan Culvert Mfrs. Assn., and head of Republic's Culvert Division. For the past 15 years Mr. Gregory has been associated with the Wheeling Corrugating Co., at Wheeling, W. Va., where he was head of the culvert department.

Out of the Woods

COMES THIS LETTER OF APPROVAL ON THE "AC" OIL TRACTOR . . .



70% SLOPES

Up and down 60 and 70 per cent slopes—this work demands an engine that is "always there". A second's delay may mean the operator's life.

GROUND SKIDDING

On overloads that pull a tractor down to the last pound . . . the A-C Oil engine's ability to hang on gets those big loads over the hump.

RADIATOR DEEP

If the "L-O" weighed any more it would be out of sight in this mud hole. Why carry dead weight up hill or in mud?



CHARLES SKEETERS SKEETERS BROTHERS
TALENT, OREGON

EVERETT SKEETERS

November 18, 1934

Mr. A. E. Mills,
Allis-Chalmers Mfg. Company,
Portland, Oregon.

Dear Sir:

In the spring of this year we purchased an Allis-Chalmers tractor from the Brewer Tractor and Equipment Company of Medford. We wish to report that outside of a few breaks and minor repairs, we have found that this tractor does what we expected it to do.

This tractor was used to log pine and fir in the Creek district. Our method is ground skidding to a landing. This tractor has anything beat for logging. We believe we have ever seen. During the season it worked in the worst ground we believe that has ever been on some of the logs we were unable to use another tractor on some of the ground we used this "L-O" on.

The average fuel cost was around \$1.96 per day in starting or with cranks, dilution for the average amount of logs put to the landing for the 40,000. On many landings we worked from nothing to a mile.

This is one of the greatest hill-climbing tractors ever seen and we would especially recommend it to hilly logging.

In the morning it took us about five minutes to start the motor until we got into operation. This is a very good record in that one has never started a tractor into operation.

We would be pleased to demonstrate and tractor to any logger or contractor that would like to see it.

Sincerely yours,
Charles S. Skeeters

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New Jersey Lists Funds For 1935 Highway Projects

The 1935 state highway construction program of New Jersey will cost \$10,532,397.50, according to the schedule submitted to Governor Moore for presentation to the Legislature. The anticipated revenues for the Highway Department during 1935 are estimated at \$40,043,551. The largest items making up this total are the proceeds of the bond issue of \$6,400,000; motor vehicle fees and fines, \$14,500,000; gas tax, \$16,300,000; and Federal Aid, \$1,600,000.

From the \$40,000,000 are deducted

mandatory appropriations of \$24,256,153. These include: \$13,860,153 for interest, sinking fund and principal payments on State bonds; \$6,735,000 to counties for road construction and maintenance, policing and lighting; and \$2,310,000 to townships, boroughs and villages.

For the administration of the Department of Motor Vehicles, \$800,000 of the highway receipts will be set aside; for the Board of Commerce and Navigation, \$90,000, and for the Free Bridge Commission, \$61,000. An appropriation of \$2,500,000 is stipulated for the maintenance of the highway system, lighting and bridge operation; and \$1,800,000 for administration, engineering, inspec-

tion and cost of acquiring right-of-way. The collection of the gas tax by the Motor Fuel Division will cost \$55,000. For the purchase of equipment and the operation of such machinery, the cost will be \$100,000.

Oysters R in Season for Texas Road-Mix

(Continued from page 2)

the winter when base was being placed and "weep holes" or drains were cut through the material to permit the rain water to drain off. During one parti-

cularly heavy rain the labor crew was sent out in a hurry to clean the drains but before they reached the far end of the work the tide had started to come in with such speed that it was necessary to rush back and plug the weep holes to prevent flooding the grade with salt water. During the winter when right-of-way markers were being set the superintendent put in his weekly report an expense item for the rental of a skiff for placing the concrete markers. They were located on the outer edge of a drainage ditch which was constantly flooded during the winter so that there was no other approach than by skiff.

Handling the Asphalt

The contractor used a distributor with a 940-gallon tank mounted on an old army truck for applying the Texaco asphaltic oil to the shell. The distributor was kept on the job constantly and was serviced by three tank trucks each of which hauled 560 gallons per trip from the Port Neches refinery of the Texas Co. 25 miles to the center of the work. Two of the tank trucks were GMC's and the third a Ford V8.

Applying and Mixing Oil

After the prepared shell had been spread to the required thickness, the distributor applied 0.42 gallon per square yard of the oil and the tractor, a truck or other hauling unit available pulled a double-disc over it to break up any tendency of the material to ball up. It has been found that the disc breaks up the balling far better than the regular blading. Then a second "shot" of 0.42 gallon per square yard was applied, disced and the third shot made to complete the specified application of 1 1/4 gallons per square yard of material 2 inches thick.

The mixing was done with the 10-foot blade which windrowed the material to the center or side of the road and back from three to twelve times until it showed a uniform color and no balling. When a rain storm which would cause trouble with the mixing was imminent the superintendent would windrow the material or "fold it up," as he expressed it very aptly, so that it would present the smallest surface to the water. This also permitted the sun to get at the base and dry it out in the shortest space of time after the rain had ceased. In spite of the dry spell last summer there were frequent heavy but short thunderstorms which interfered with this type of work as oil and water do not mix, nor will oil and shell mix satisfactorily in the presence of water.

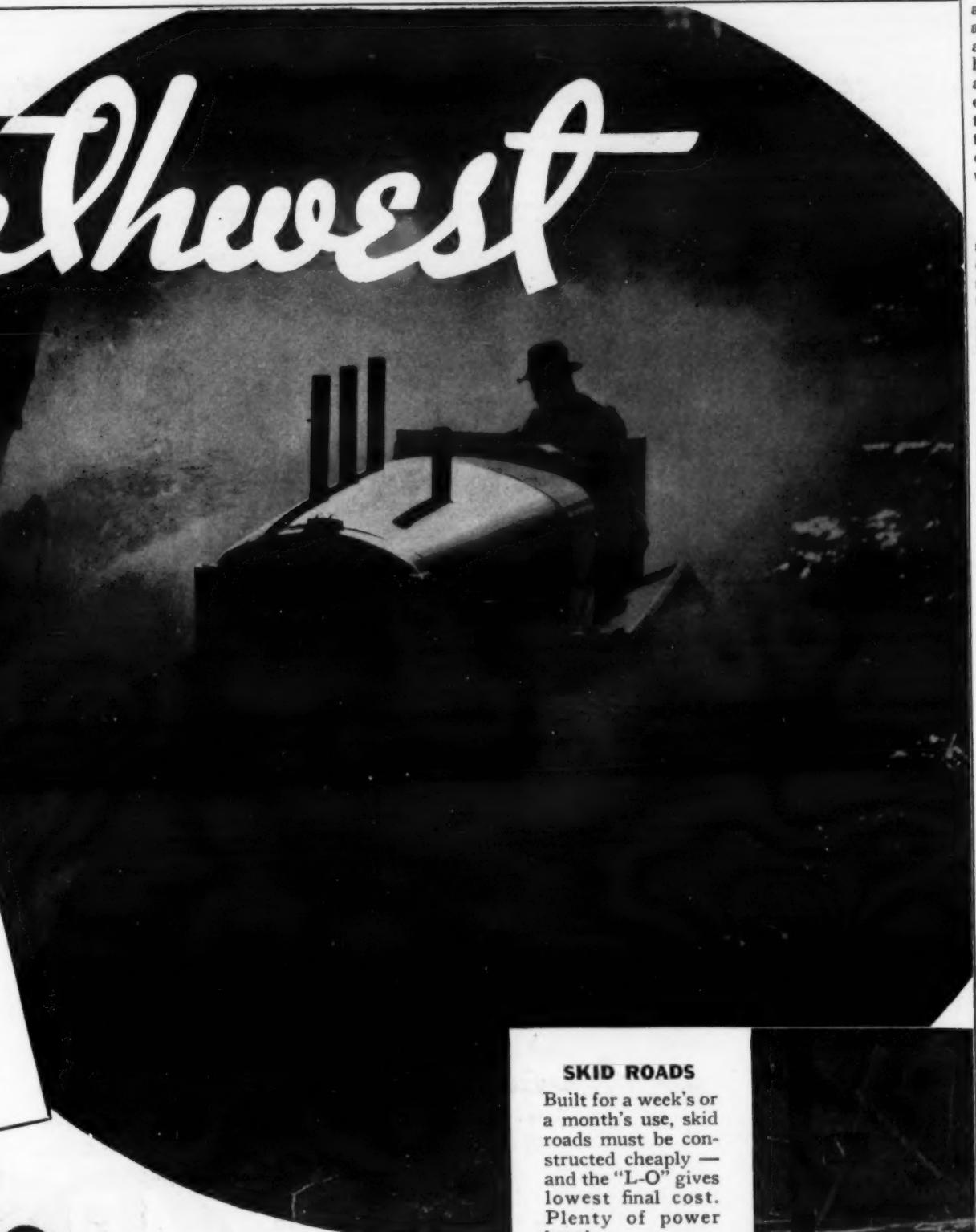
Traffic Did the Compacting

After the materials were thoroughly mixed by blading, the resulting surface material was bladed out to the stakes set by the state engineering party and traffic allowed to compact it. As there is always a tendency for traffic to run in the smoothest track or rut on a road, vehicles were forced to use the edges of the road by placing barricades along the center. Also the maintainer was run over the surface constantly to fill any ruts, low spots or breaks that might develop. The work of the maintainer was usually completed within two or three days. A road roller was kept on the job as the specifications required rolling but the Resident Engineer found that its use was unnecessary.

Next spring the state maintenance forces will put a seal coat of 0.3 gallon per square yard of AO-230T oil of 230-250 penetration over the entire road. The cost of the road-mix surface, including the washed crushed shell, the oil, mixing and spreading, was 35 cents per square yard.

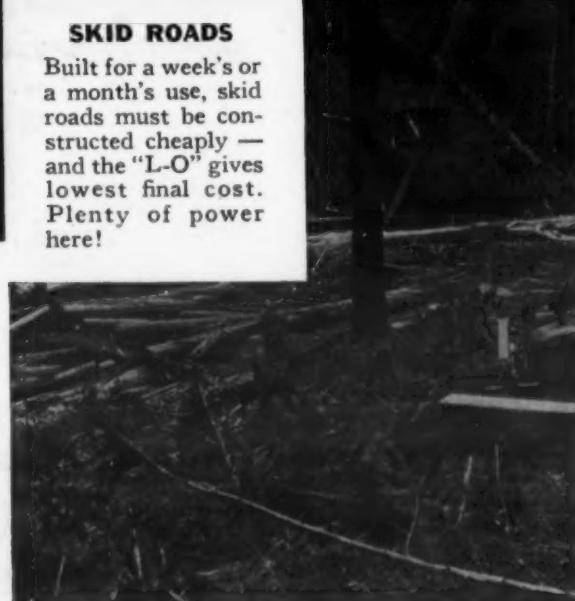
Personnel

Haden & Austin, Inc., Houston, Texas, was the contractor for the mixed top and Charles A. Wood was their Superintendent. For the Texas State Highway Department, J. W. Summerville was Resident Engineer.



SKID ROADS

Built for a week's or a month's use, skid roads must be constructed cheaply — and the "L-O" gives lowest final cost. Plenty of power here!



Logging service is without question the toughest of all tractor jobs. It takes that extra something which A-C tractors have to stand the punishment of working on rocky slopes, over trees, in continual dust, on big overloads. A-C's will give dependable performance on YOUR job, too.

ALLIS-CHALMERS
TRACTOR DIVISION-MILWAUKEE, U. S. A.

Calcium Chloride Helps Subdue Icy Pavements

THE season of the year when we may expect icy conditions to develop at intervals on highways and city streets is with us. Numerous accidents, many of which are fatal, have in the past been attributed directly to lack of traction due to ice on roadways. Of lesser importance than the protection of human life but also a matter of vital concern to the official charged with highway safety has been the property losses from collisions and the loss of time to the public occasioned by the necessity for slower progress on slippery roads.

The recently published report of the Maintenance Committee of the Highway Research Board on "The Treatment of Icy Pavements" helps in the solution of the ice hazard problem. The findings of this committee were adopted at a recent meeting of the American Society for Testing Materials and are accepted as a standard of that organization in the treatment of icy pavements. The report covers a three-year study which has involved field observations and extensive research in the laboratories of the Michigan State Highway Department and the Engineer Department of the District of Columbia.

The research included a study of the use of calcium chloride and sodium chloride in combination with abrasives such as sand as a means of increasing traction resistance. The presence of the chemicals creates sufficient thawing of the surface of the ice to embed readily the abrasive particles. The investigation also covers the relative melting power of these two salts and their effect on cement concrete surfaces when subjected to repeated freezings and thawings.

Practical Data From Report

"After careful consideration of the results of these investigations, the Committee makes the following recommendations:

Use: If the treatment is to be applied to cement concrete pavements, the use of calcium chloride is recommended.

"In the case of pavements other than cement concrete the Committee has had no information that either calcium or sodium chloride will promote disintegration by freezing and thawing and therefore either of the chemicals may be used, excepting that calcium chloride is preferable at temperatures lower than 6.5 degrees F. below zero.

Abrasive Materials: Cinders are preferable, although coarse sand may be used since it is more generally available.

Preparation of Stockpiles: In treating stockpiles to prevent freezing, 25 to 50 pounds of calcium chloride or sodium chloride for each cubic yard of abrasive should be spread over the piles either dry or in solution.

Application: At the time of application, the material should be treated with an additional fifty pounds of flake calcium chloride or sodium chloride per cubic yard. The treated abrasive should be applied at the rate of 1½ to 2 pounds per square yard of pavement surface. Mechanical spreading is preferable to hand work.

"The use of either chemical, without abrasives, for the purpose of removing ice is not recommended for general practice, excepting in cities where abrasives tend to clog drainage systems. In such cases it is desirable to remove the resulting slush from the pavement.

"There is definite information that the presence of sand or cinders on the pavement surface, after the ice has melted, will cause damage to the pavement by grinding action under the wheels of vehicles. It is therefore important not to apply an excess of sand or cinders and to remove any accumulations of such abrasives from the bottoms

of grades or other locations where they may collect.

Conclusions

"The relative ice-melting power of the two chlorides constitutes a measure of their ability to embed sand. In these tests sodium chloride had the greater melting power and therefore the greater potential sand embedment property at temperatures above approximately plus 10 degrees F. Between plus 10 degrees F. and minus 6.5 degrees F. the differences in melting power are slight. Below minus 6.5 degrees F., approximately the eutectic point of sodium chloride, this salt has no melting or sand embedment power, whereas calcium chloride continues to be active down to its eutectic point, minus 58.5 degrees F.

"Disintegration of concrete, which may occur in connection with the treatment of icy pavements with chlorides, is not due to the action of the chlorides, but rather to the repeated freezing and thawing action produced by the treatment.

"Both sodium and calcium chloride, applied to the surface of concrete, increase the pitting and scaling which may occur from repeated freezing and thawing. The use of sodium chloride is more detrimental than the use of calcium chloride.

"One of the most important factors controlling the severity of pitting and scaling is the amount of chert, shale, or soft stone that exists near the surface of the concrete. It is evident from a detailed study of the specimens that the presence of such material near the surface would almost invariably result in deep pitting and removal of surface mortar.

Tests Made Under Most Severe Conditions

"It should be noted that the results from these tests were due to 30 cycles of freezing and thawing and the solutions of chlorides were the maximum amounts which might be used. In practice, a considerable amount of the chloride would be absorbed or adsorbed by the abra-

sive and much of it would be dissipated by traffic. Such results as are shown by these tests would be found only where concentrations of the solutions and abrasives were permitted to remain on the surface of the concrete and where conditions were such that repeated freezing and thawing would occur. The tests do indicate, however, the importance of the proper supervision and care which should be exercised in using this method of treatment of icy pavements.

"Field observations of concrete pavements indicate that:

"There are comparatively few cases where pavement scaling can be attributed to the use of calcium chloride in the treatment of ice.

"Many pavements where calcium chloride has been used over a period of years in the treatment of ice show no indications of scaling.

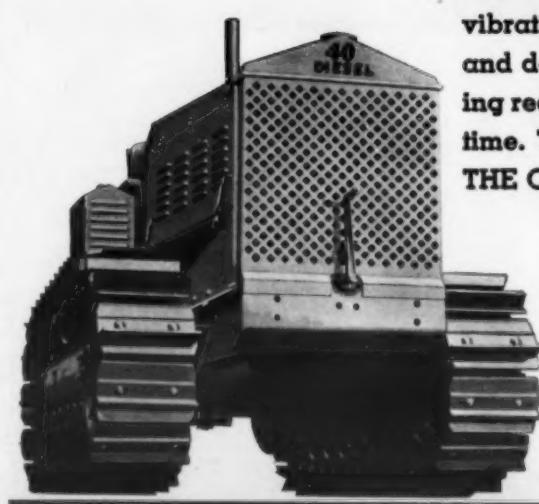
"The Committee believes that the importance of safeguarding life and property on icy pavements far outweighs the minor damage that may be done to the pavements."

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You are invited to visit our exhibit at the A. R. B. A. Convention, Washington, D. C., January 22nd - 25th.



CLETRAC CRAWLER TRACTORS

Lehman Sees 1935 Revival in Heavy Industries

All signs point to a substantial revival of the heavy industries in 1935, according to Albert C. Lehman, President, Blaw-Knox Co., Pittsburgh, Pa., who feels that the estimates of the Durable Goods Industries Committee that \$5,000,000,000 worth of industrial machinery and power plant equipment must be bought to make good deferred

maintenance is a conservative estimate. About \$2,000,000,000 is needed for new homes and there is nearly \$1,000,000,000 of potential business in the farm field. Thousands of small communities have no water and sewer systems. Fully 4,771 water works and sewer projects costing over \$1,000,000,000 could go into construction in 1935.

The performance of this work, which is already begun, means increased employment for the 10,000,000 men formerly employed in heavy industries. As

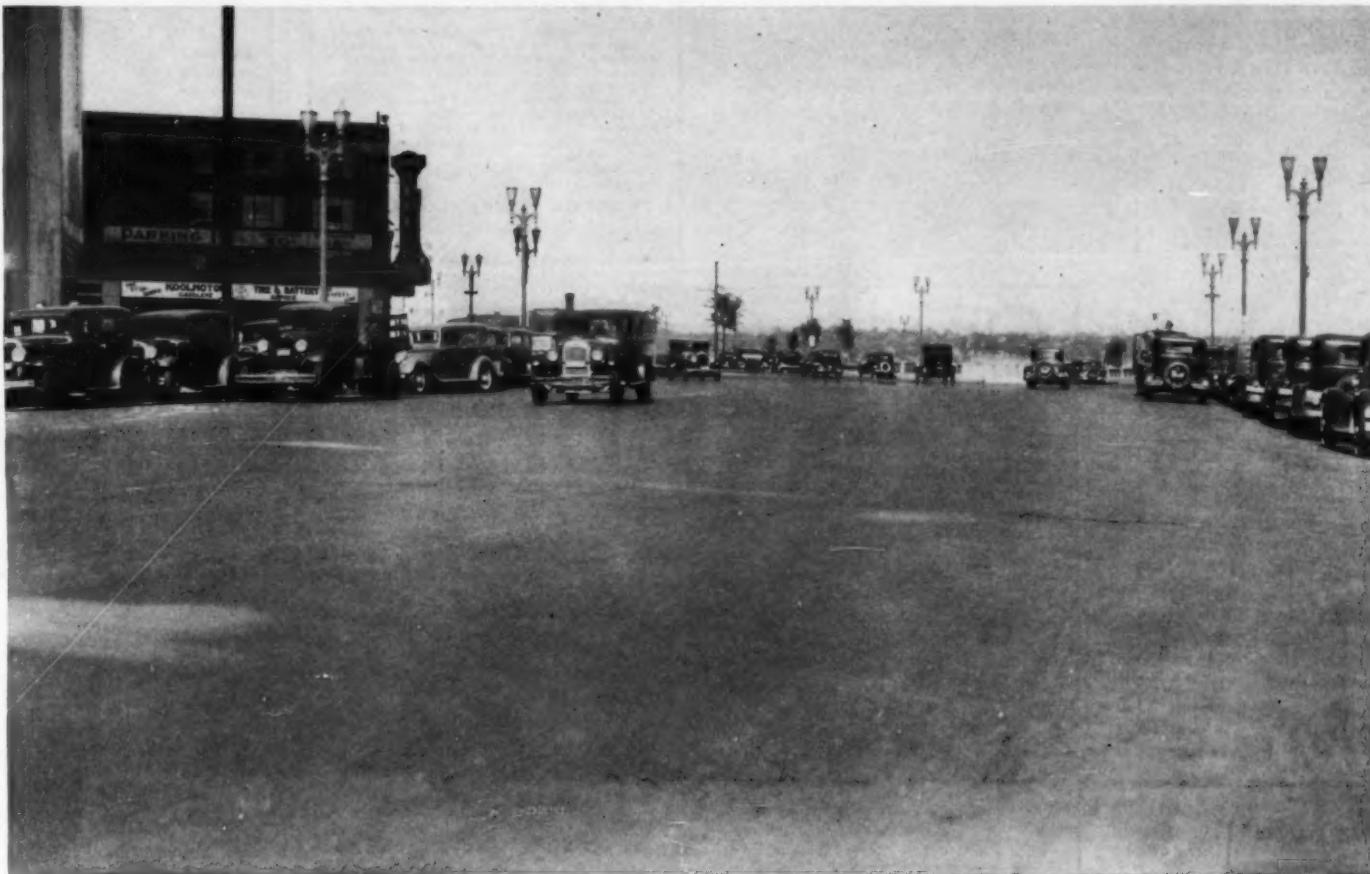
this represents 20 per cent of the total gainfully employed people of the United States, it means complete recovery for the country.

MORE BRICKS USED IN 1934

The total shipments of paving brick used in 1934 will amount to 125,000,000, or at least double the quantity used in brick pavements in 1933, according to a recent report from the National Paving Brick Association.

Cutting Structural Steel by Oxy-Acetylene Process

A 16-page booklet, "Recommended Practices for Gas Cutting of Structural Steel" issued by The Linde Air Products Co., 30 E. 42nd St., New York City, contains information of inestimable value to every welder. Included are definitions and general recommendations, details of qualification tests for workmanship, safety precautions and a chapter on cutting practices.



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SMOOTH . . . LONG-WEARING . . . RESILIENT — Stanolind Asphalt in St. Paul, Minn. . . .



Summit Ave., St. Paul, Minnesota



Pleasant Ave., St. Paul, Minnesota



County Road No. 7,
Hennepin County, Minn.

ST. PAUL, with long experience, has developed asphalt pavements beyond the experimental stage and knows which type and kind of construction gives best results on its thoroughfares.

Properly constructed asphalt pavements are popular because of low first cost and long wearing qualities with a minimum of maintenance.

Asphalt pavements are especially desirable in residential districts. They develop less noise and present cleaner appearance, more appropriate to such surroundings.

Standard Oil Company (Indiana) representatives are ready to furnish information on all paving problems.

With the correct type of asphalt construction selected, the use of Stanolind Paving Asphalt Cement and careful and correct construction methods, the desired results are secured.

STANDARD OIL COMPANY
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Chicago, Illinois
NRA
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ASPHALT *for every Purpose*

ASPHALT FOR PAVING . . . ASPI

Truck-Mixer Paving

(Continued from page 14)

are popular with some finishers. These are shaped like the familiar tailor's sleeve board used for pressing and when wielded by expert finishers are effective for close work from the edge or from bridges. The last finishing tool for use across the entire slab was a 12-foot wooden belt 12 inches wide. The finishers also picked up the caps from the expansion joints and edged the concrete at either side of the joints and along the forms. After the concrete had been checked for smoothness with a straight-edge it was broomed to give the effective non-skid surface which is used in New York, Massachusetts, and other states.

This very summer the Editor had an experience that very forcibly proved the value of this type of surface treatment. Driving from Johnson City, Tenn., to Knoxville in the rain he watched many cars ahead of him skid on the oil film worked into an emulsion by the tires of the passing cars on the smooth concrete. Trying out the effect on new tires he found that they too skidded until they reached the strips of clean concrete either side of the band of oil drippings from countless crank-cases. Brooming prevents this skidding very effectively.

Used Cotton Blankets

Immediately after the green concrete was finished and broom-marked, the subcontractor's two men placed the curing blanket over the slab. This blanket, composed of two layers of burlap with a cotton filler between, was made up in 25-foot lengths 12 feet wide and rolled on 2 x 2-inch poles with metal ferrules at the ends. It was necessary to wet the cotton blanket only twice a day instead of practically continuously as with the more usual type of single thickness of burlap.

Labor and Hours

The contractor complied with the PWA regulations as regards the employment and hours and wages of labor. On the rough grading, where there was considerable dirt to be moved, the contractor worked three 5-hour shifts a day while the light was good. This was cut to two 6-hour shifts for paving later.

Quantities and Prices

The major quantities and unit prices on the Lincoln-Concord section described particularly in this article were:

Item	Quantity	Price
Earth excavation	164,100 cubic yards	\$.33
Ledge excavation	6,700 cubic yards	.33
Ordinary borrow	12,300 cubic yards	.25
Gravel borrow	38,100 cubic yards	.15
Bridge excavation	1,350 cubic yards	1.00
Past excavation	6,350 cubic yards	.20
Concrete surfacing	11,000 cubic yards	7.00
Reinforcing steel	303,600 pounds	.033

Personnel

The contract for the 2.746-mile Lincoln-Concord section of the Cambridge-Concord highway was awarded to B. Perini & Sons, Inc., of Framingham,

"The Strongest Geared Power for Its Weight in the World" —

BEEBE ALL-STEEL HAND HOIST

Capacity—5 tons straight line
Weight—110 pounds
Size—16x17x13" high
Two speeds—4 to 1; 24 to 1
Positive internal brake
Price \$75. Write for list of dealers



Mass., for \$266,212.94. For the contractor the work was in charge of Jack Doherty as General Superintendent, with A. Macauley as Superintendent of this and one other section. Both Louis Perini, President and J. R. Perini, Treasurer, were active in the management of these contracts. A. R. Berry was Resident Engineer on this section for the State Department of Public Works, under the direction of F. D. Sabin, District Highway Engineer.

Indiana Equipment Co. Sells Grading Contractor

Howard E. Stroh, grading contractor of Spencer, Ind., is just completing a 400,000-yard grading job at Spencer, on Road 67 for which he purchased Caterpillar Thirty-Five, Fifty and Seventy gas and diesel tractors, a Caterpillar grader No. 44, and an Ingersoll-Rand 9 x 8-inch portable air compressor from the Indiana Equipment Co., Inc., Indianapolis, Ind.

Springfield, Mass., Buys Heavy-Duty Snow Plows

The city of Springfield, Mass., has recently purchased from the M. B. Tyler Co., Inc., 344 Columbus Ave., Springfield, Mass., distributor of track-type tractors, industrial tractors, snow removal equipment and road building equipment, seventeen Model 200 OWH

Wausau one-way hydraulic snow plows and two V Type Wausau 115 snow plows. Tyler has helped his city to be ready for a duplication of last winter's heavy snowfall.

A HANDY TRAILER MIXER

This 3 1/4-cubic-foot Trailer Mixer may be loaded or discharged from either side, as it is fitted with an interchangeable lock. Ball bearing head with few wearing parts. It is easily and quickly moved from one job to the next because of its strong rubber-tired steel wheels (with 6-inch hubs). Power is furnished by a reliable 1 1/2-hp. engine.

Write for complete specifications



The J. B. Foote Foundry Co., Fredericktown, O.

One --- • • ETNYRE DISTRIBUTOR --- Leads to Another



This is an 850-gallon ETNYRE Model MO2C distributor spraying a 14-foot driveway. Circulating spray bar with instantaneous shutoff at nozzles can be furnished up to 24 feet in width.

Etnyre distributor owners offer the best evidence that Etnyre distributors give correct, accurate application of any and all road oil, emulsions, tar and asphalt materials; dependability and long life; by repeat orders again and again.

We suggest that you ask an Etnyre distributor owner his experience before ordering your next distributor.

For complete literature, prices and terms of payment write

E. D. ETNYRE & COMPANY

DEALERS IN ALL PRINCIPAL CITIES

400 JEFFERSON ST.,

OREGON, ILL.

100 Yards of Concrete Poured Per Hour

(Continued from page 2)

would be transported by cement buggies from the barge.

A revolving crane built by Siems-Helmers having an 85-foot boom and a 3-yard clamshell bucket and operated by a 10 x 12 American hoist is located at the stern of the mixing barge and handles all the sand and gravel from the aggregate barges to the bins of the Blaw-Knox weighing batching plant.

Automatic Batching Plant

The batching plant is full-automatic in operation. The batches, which produced a 2.1-yard mixed batch, consisted on the average of 2,900 pounds of sand, 4,000 pounds of gravel, 10 to 13 bags of cement per batch and 6½ gallons of water per bag of cement used. The concrete produced varied from 2 to 5-inch slump, depending on the use for which it was intended. For the backing of the granite facing a 5-inch slump was used to be sure that the crevices between the blocks were well filled to produce a solid block.

A single batching device was used for the two mixers with a 2-way gate to deliver the aggregate to one or the other as desired. The cement and water were weighed out automatically by solenoid control. River water was used for the mixing water pumped into the measuring tank by a small pressure pump which started and stopped according to the height of the water in the tank. The cement was weighed out, or delivered to the weighing batcher by a revolving cylinder feed which was stopped instantly by a special brake when the weight reached the proper amount. A General Electric motor and switch controlled the feed.

Mixing and Delivering the Concrete

The mixing plant consists of two Ransome steam-driven 2-yard mixers set forward on the barge with a receiving hopper immediately in front of and below them to receive the batches as soon as completely mixed and deliver them to the bucket of the Insley hoist tower.

The 2-yard hoist bucket was handled by an American 11 x 12 steam hoist in the 115-foot Insley tower. With this equipment and the usual series of counterbalanced semi-circular chutes it was possible to chute concrete a distance of 145 feet from the forward end of the mixing barge.

The Power Plant

The equipment on the barge is all steam or electrically operated. In the latter case the power is supplied by a 100-hp General Electric generator driven by a Curtis steam turbine. This furnishes the power for the Fuller-Kinney pump and the other electrically-operated units. The central power plant consists of 460-hp steam boilers fired with fuel oil. A total of 1,000 cubic feet per minute of compressed air at 60 pounds pressure is furnished by a Worthington stationary compressor for the cement pump, and a 7-kw emergency lighting plant made by General Electric is a part of the equipment.

Limestone Quarry for Sale

Fully equipped and now operating. Products passing highway specifications; located in Central Pa., in midst of numerous highways being constructed, contracted for or proposed. Owners in other business. Address: S-184, Contractors & Engineers Monthly, 470 Fourth Avenue, New York.



C. & E. M. Photo
The Floating Concreting Tower

The Auxiliary Tower

For use where the 115-foot tower of the mixer barge would not serve to carry the material high or far enough, as when concreting the shafts of the river piers, an auxiliary tower derrick was built. This unit was built up on a pair of steel barges each measuring 18 x 95 feet and carrying the frame of the tower derrick which spaced them so as to give an overall measurement of 50 x 95 feet. The structural steel tower was 25 feet x 50 feet at the base and was mounted on two cradles of 20-inch I beams which completely encircled the barges fore and aft. The tower, which was 100 feet high, carried a derrick with a 78-foot boom pivoted at the center of one side of the tower and with four legs, one carried to each corner of the tower. The power for the operation of the derrick was supplied by a 60-hp oil-fired steam boiler mounted on the barge and delivering steam to the American 9 x 12 hoist. This tower derrick handled 2-yard Blaw-Knox roller-gate buckets for pouring the pier shafts.

Pouring the Land Pier on the West Bank

In order to pour the footing, base and shaft of Pier A on the west shore of the river and about 250 feet from the bank, a trestle about 250 feet long, carrying a double narrow-gage track, was built from the shore to the pier site. Concrete was chuted from the plant to the 2-yard concrete buckets which were handled by the tower derrick and placed on the flat cars and hauled in to the pier site.

Personnel

The Mississippi River Bridge was built by the Public Belt Railroad Commission of New Orleans acting for the



CUT THE COST OF WINTER OPERATIONS WITH J. & S. TRACTION TREADS

Here is the equipment you need NOW for your Dual Tired Trucks, Tractors, Motor Graders, etc. J & S Traction Treads will put every ounce of Engine Power into your Tractor Wheels in Mud, Sand or Snow and Ice.

Easily attached with positive adjustable lock which compensates for tire wear and tire variation.

J & S Traction Treads are made in two style shoes,

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with grouters integral as shown or with quick detachable grouters.

Shoes are made of special wear-resisting heat treated steel. Pins and Connecting Links are special alloy steel and hardened.

J & S Traction Treads do not injure tires but protect them. Made to fit all sizes of Dual Pneumatic Tires. Write for prices, addressing your inquiry to Department C.

ROGERS as usual have something entirely NEW!! HEAVY-DUTY TRAILERS on PNEUMATIC TIRES

These trailers are equipped with 10 pneumatic tires with carrying capacity from 10 to 40 tons. The rear assembly is equipped with 8 pneumatic tires on 4-rocking axles, which allows the load to be equally distributed on each of the 8 rear tires. These trailers like all other ROGERS are low in construction and up-keep.

ROGERS BROTHERS CORP.

108 Orchard St.,

ALBION, PA.



Write in for further information today!

State of Louisiana. The Designing and Supervising Engineers were Modjeski, Masters & Case, Inc., of New York City for whom C. G. Melville was the Resident Engineer. Siems-Helmers, Inc., of St. Paul, Minn., was general contractor for the main bridge substructure, with N. F. Helmers, Vice President and Manager, in immediate charge of the work. J. M. Kellogg was General Manager of this contract, C. E. Ryan, General Superintendent, and Julian H. Levy, Resident Engineer.

Fire resistive buildings under construction may not burn, but their contents can, and do! Take extra precautions this winter.

Scientific Management Congress Next July

The International Congress for Scientific Management will be held in London, England, from July 15 to 20, 1935. About 2,000 members from all parts of the world are expected to attend. There will be an official reception by the British Government, and the Court of Common Council of the City of London will extend to delegates an invitation to an evening reception in the Guild hall. Several other official social functions will be organized. Many facilities will be provided to insure that members will pass their time usefully and pleasantly.



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Survey Shows Long Life Of Bituminous Pavements

A survey designed to assemble all available data bearing upon the economic life and the life expectancy of bituminous pavements, covering all of the 93 cities in the United States having a population of over 100,000, has recently been completed by the Asphalt Institute. A total of 72 cities, having a combined population of 32,276,682 or 88.9 per cent of the total population of all cities over 100,000 population, reported.

These 72 cities reported an area of 367,252,044 square yards of bituminous pavement, or the equivalent of 33,387 miles of 18-foot pavement. St. Louis, Mo. has the distinction of reporting the oldest asphalt pavement now in use after 49 years, while Washington, D. C. and New Orleans, La., are close behind with 47-year-old pavements. Asphalt pavements of more than 40 years of age now in use are reported by 23 cities while 60 of the 72 report higher than 30 years for the oldest.

The reports as a whole show 66 per cent of sheet asphalt, 60 per cent of asphaltic concrete and 66 per cent of bituminous macadam now more than 10 years of age. The average age of sheet asphalt to date is reported at 18 years, asphaltic concrete at 13 years and bituminous macadam at 14 years for pavements now in use.

The actual length of service rendered by each type of pavement before resurfacing became necessary is shown by the combined reports to have been as follows: for sheet asphalt, 18 years in the business district, 22 years in the residential district, or an average of 20 years; for asphaltic concrete, 14 years in the business district and 18 years in the residential district, or an average of 16 years; for bituminous macadam, 11 years for the business district and 14 years for the residential district or an average of 12½ years. A most important point to consider is the fact that bituminous pavements consist of two courses—base and top, and that resurfacing usually means renewal of only the top course and seldom involves the expense of reconstructing a new base.

The average life expectancy of bituminous pavements as shown by these estimates is: for sheet asphalt in the business district 19 years; in the residential district 26 years, average 22½ years; for asphaltic concrete in the business district 19 years; in the residential district 25 years, average 22 years; for bituminous macadam in the business district 17 years, in the residential district 22 years, average 19½ years.

Shovel Parts Delivered to Bonneville by Air

When a large steam shovel in operation at the Bonneville Dam was put out of commission recently because of a small breakdown, air express came to the rescue of the contractor and delivered the needed parts from Kansas City, Mo., to Portland, Ore., between 5:30 one afternoon and 7:00 the next morning. When the breakdown occurred the Marion Steam Shovel Co. was notified by telephone to forward the part by air express. It was loaded aboard the United Air Lines 3-mile-a-minute plane for its speedy flight half way across the country. The needed parts, weighing 25½ pounds, were met at the Portland Airport by a representative of the Columbia Construction Co. and taken directly to the dam site at Bonneville by automobile, a distance of approximately 40 miles. The part was then assembled in the steam shovel and the shovel put into operation immediately. The total loss of working time was less than 24 hours.

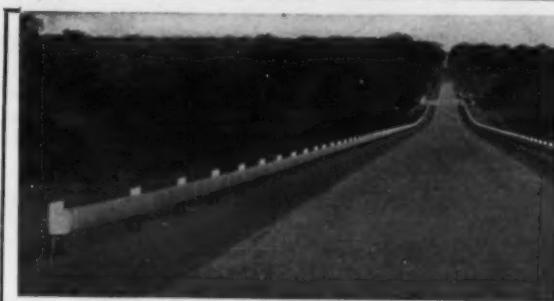
Greensboro Contractor Completes High Point Job

E. F. Craven Co., Greensboro, N.C., distributor, whose slogan is, "Everything for Counties and Contractors" tells us that Leon Ellis, highway contractor of Greensboro, has completed his High Point paving contract which consisted of widening and paving English Street

which is part of North Carolina Highway No. 10. The contract price for the paving was \$57,600. The city of High Point cleared the right-of-way, a building at the corner of Main and English Streets was torn down and another structure gave way for a sidewalk. Ellis had 60 days in which to do the job and completed it on the dot with his 27-E Rex paver.

Blaw-Knox Elects New Vice President

Directors of the Blaw-Knox Co., Pittsburgh, Pa., recently elected Robert F. McCloskey Director and Vice President in charge of operations of the plants located at Blawnox, Pa., to succeed Wayne Rawley, deceased. Mr. McCloskey has been with the firm since 1920.



Tuthill Guard Rail—Low Cost, High Efficiency

TUTHILL HIGHWAY GUARD

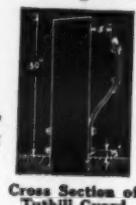
The strongest and most effective steel plate guard rail.

The easiest guard to erect.

ASK FOR COMPLETE DATA

See our exhibit at the American Road Builders' Convention, Washington, D.C., January 22-25

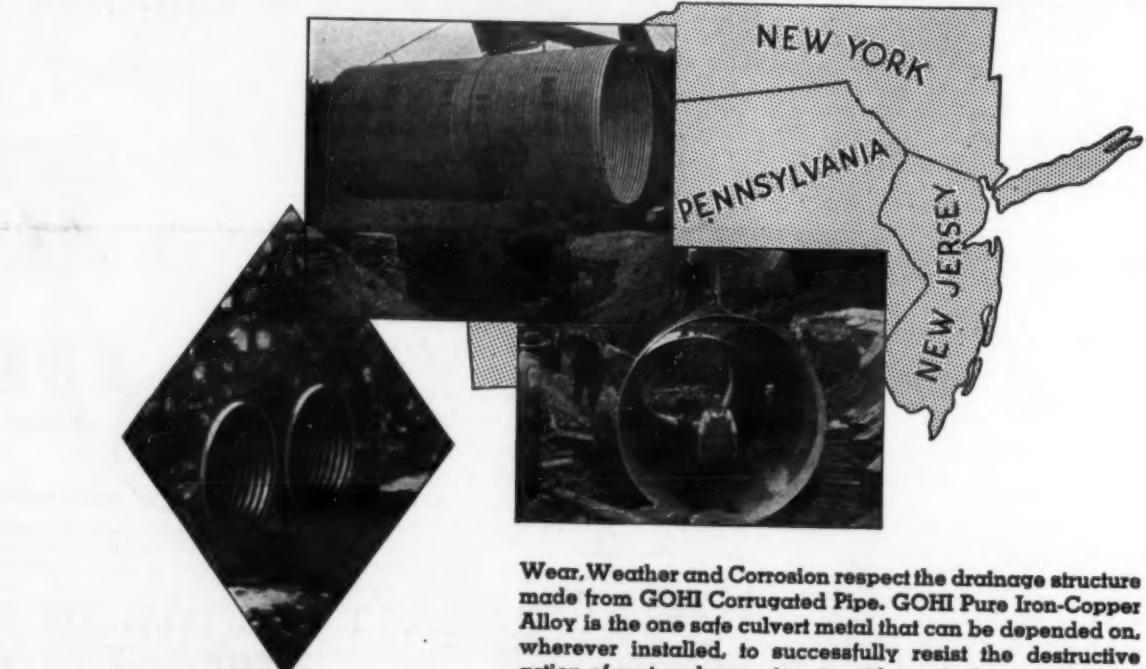
Tuthill Spring Co., 760 Polk St., Chicago



Cross Section of Tuthill Guard

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in the Middle Atlantic States...



Wear, Weather and Corrosion respect the drainage structure made from GOHI Corrugated Pipe. GOHI Pure Iron-Copper Alloy is the one safe culvert metal that can be depended on, wherever installed, to successfully resist the destructive action of rust and corrosion; to withstand alternate freezing and thawing, settling and shifting fills; the ceaseless pounding of heavy traffic, without failure.

In the Middle Atlantic States as in all other sections of the country, Highway Engineers use GOHI Corrugated Pipe to permanently solve drainage problems, in the minimum time and at the lowest cost. These, and many other reasons, should make GOHI Corrugated Pipe your choice wherever there is a drainage problem to be licked.

Consult the fabricator nearest you.

F. Yeager Bridge & Culvert Works, Port Huron, Mich.
Bancroft & Martin Rolling Mills Co., S. Portland, Me.
Denver Steel & Iron Works Co., Denver, Colo.
Feeney Machinery Co., Portland, Oregon
St. Paul Corrugating Co., St. Paul, Minn.
Capital City Culvert Co., Madison, Wis.
The Newport Culvert Co., Newport, Ky.
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Meets copper-bearing pure iron requirements in all accepted specifications for corrugated metal culverts.

GOHI CORRUGATED PIPE

PRONOUNCED "GO-HIGH"

GOHI CULVERT MANUFACTURERS, INC., . . . NEWPORT, KY.

New 1½-Ton Truck Has High Speed

With special attention given to speed, sturdiness, ease of steering, smoothness of riding, reliability, and safety on the road, the Four Wheel Drive Auto Co., Clintonville, Wis., has developed a new 1½-ton high-speed truck which is designated as Model HS. Specifications call for a road speed of 47 miles per hour with full load.

Power is furnished by an 84-hp engine which develops 185 foot-pounds torque. The fundamental principle of applying power equally to all four wheels, which is used in all previous models of this company's line, is retained in the new Model HS. Ease of steering and simple handling is increased by setting the front axle back 42½ inches from the front bumper, which also provides equal distribution of the load. Power from the engine is transmitted to the four-speeds-ahead transmission through a 12-inch plate clutch, and from the transmission main shaft level the power is transferred to the center differential where it is divided and distributed to each axle.

Complete control of the speed-truck is maintained through four-wheel hydraulic brakes operated by a vacuum booster. The HS can be stopped within its own length at average road speed.

Grade Elimination in Texas

A total of forty-five grade elimination projects have been completed or projected under the NRA program in Texas, thirty of which involve underpasses, and fifteen overpasses. The largest project is a triple underpass project under the tracks of the Union Terminal Co. to take care of the three main streets of Dallas. Bids on this project were received September 12, 1934, and the estimated cost is approximately \$750,000, including the necessary preparatory work of adjustment of tracks, and the signal system of the railroad company. The largest single overpass is that of the Stockyards Viaduct in the North City Limits of Fort Worth.

The completion of these grade separation structures make an aggregate of approximately 1,018 grade separation structures which have been eliminated in Texas during the past twelve years; 653 by relocation, 255 underpasses, and 110 overpasses. Some of the earlier types will require reconstruction in the near future on account of revisions in the State Highway system, relocation of highways to secure more direct routes, and also to provide wider roadways and easier curves approaching the underpass and overpass structures.

This program has been handled under the general direction of Gibb Gilchrist, State Highway Engineer; G. G. Wickline, Bridge Engineer; together with the various division engineers of the State Highway Department in whose districts the work involved has been located.

Editor's Note: An article on a triple underpass in the North City Limits of Houston appeared on pages 19-21 in the October, 1934, issue CONTRACTORS AND ENGINEERS MONTHLY.

Carloads of Conveyors For Grand Coulee Dam

Speedy co-ordination between well-known industrial organizations resulted in rush shipments of three carloads of conveyor belts, totalling more than 100,000 pounds, from New Jersey to the site of Grand Coulee Dam in the State of Washington. These belts were made up at the Passaic, N. J., plant of the U. S. Rubber Co., for the Jeffrey Mfg. Co., of Columbus, Ohio, for use in connection with equipment furnished to Mason, Walsh, Atkinson, Kier Co., contractor



World's Fair Exhibit Made Permanent by Ford

The giant gear-shaped rotunda of the Ford Exposition at Chicago's 1934 Century of Progress is to be re-erected on a permanent site opposite the Ford Administration Building at the Rouge Plant, Dearborn, Mich., and surrounded with a 12½-acre landscaped park. The spectacular lighting effects used by Ford at the Fair, the famous "Roads of the World," the vast photographic murals depicting industrial scenes at the Ford Plant, and many of the exhibits seen by millions at Chicago will be permanently placed on display in this new Ford project.

Seventeen days after the first order was received by telephone in Passaic, N. J., a carload of 60-inch belt totaling nearly half a mile in length and weighing approximately 23 tons had been made up, shipped across the continent and delivered on the site of the dam. Meanwhile another order for a carload of 48-inch belt and then a third order for more 60-inch belt were placed, the belts produced and rushed through with comparable speed.

A New Year's Statement

Business and government are beginning to pull together, said A. W. Robertson, Chairman, Westinghouse Electric & Mfg. Co., in a statement for the New Year. As these forces learn to work in harmony under the new conditions, marked improvement in economic conditions may be expected. The fall business of electric manufacturers was the best in three years. Prospects for 1935 are good.

New Vice President Elected by Caterpillar

C. Parker Holt was named Executive Vice President of the Caterpillar Tractor Co., Peoria, Ill., by the Board of Directors on December 7. At the same meeting, Thomas J. Conner was made Vice President in charge of manufacturing and was elected a Director of the company to fill the vacancy on the Board of Directors caused by the recent death of Pliny E. Holt.

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DIFFERENTIALS**

**The OIL for
MOTORS**

**The HEAVY for
ROLLERS, BEARINGS
AND CHASSIS**

Metal Cribbing Stopped Mesa Verde Park Slide

A troublesome and costly slide which had allowed extensive settlement of the roadway fill on a new road in Mesa Verde National Park, Colo., was recently cured by U. S. Bureau of Public Roads engineers by the erection of an Armco metal crib wall. The wall was designed to be 78 feet long and 19 feet 4 inches high and to contain 1,508 square feet of facial area. The design called for a front crib of 6-foot headers and 6-foot stretchers with an anchor crib of 6-foot stretchers and 4-foot headers from the base to a height of 10 feet.

Considerable difficulty was encountered in excavating for this wall as the material was loose, and sheeting was necessary to protect the workmen. The foundation of the wall consists of shale for its entire length, with the exception of two cribs at one end which were placed on a sandstone formation. The shale foundation necessitated an excavation of unusual depth to secure stability, the hole in which the cribbing was placed being approximately 10 feet deep on the downhill or face side of the crib wall.

Drainage

Test holes had indicated that water would be found at 16 feet so Armco perforated corrugated pipe was laid in a trench on a layer of gravel at the back and below the bottom row of stretchers, to intercept the water. After construction was started a solid foundation was found at one end of the wall about 14 inches above the remaining length of wall. This condition made it possible to eliminate the bottom row of stretchers in three cribs at this end. The bottom row of stretchers was laid level and the headers were placed at the proper grade to provide a batter of 2 inches in 1 foot in the face of the wall. As the highway is on a grade of approximately 4 per cent, the top stretcher units were omitted on some of the cribs to prevent one end of the wall from extending above the shoulder of the highway.

In placing the cribbing members, backfilling was carried out as rapidly as erection went ahead so that the wall was never more than 3 to 4 feet higher than the filling material. The wall in its final form consisted of four cribs 16 stretchers high; five cribs 15 stretchers high; and four cribs 14 stretchers high.

Economy

The elimination of the cribbing members mentioned above reduced the facial area of the wall as constructed to 1,305 feet. The cribbing members which had been supplied for this wall according to the original design, and were left over, were used in laying the base of a second wall to be 48 feet long. This base was laid up three stretchers high with the anchor crib two stretchers high.

Fred C. Hill was Resident Engineer for the Bureau of Public Roads, and the work was done by C. H. Lindstrom & Son. E. P. Leavitt is Superintendent in Mesa Verde National Park.

Redesigned Distributor On Powerful Light Truck

The story on the new Etnyre X type distributor which is being exhibited by E. D. Etnyre & Co., Oregon, Ill., at the Road Show this month in Washington, D.C., is an interesting one.

New England contractors, municipal and highway officials and bituminous material companies have been greatly interested in the new Warford 4-ton truck, powered by the Ford V-8 motor, developed through the Baumis-Warford Co., 363 Highland Ave., Somerville, Mass. The powerful unit they have developed has double drive on the two rear axles, giving four driving wheels,



The New Etnyre Distributor

has an extra heavy frame and built-in auxiliary transmission.

This Warford 4-ton truck with a chassis weight of 5,700 pounds and with the extra drive and reinforced chassis is being used to mount the new Etnyre X type distributor. The truck frame being 9 inches lower than any standard conventional type truck, it was necessary to redesign the well-known Etnyre distributing and circulating system and out of it has come the remarkable new unit which eliminates much piping, two valves, two joints and the gaskets and one discharge strainer. The pump, intake valve, distributing and circulating valves and circulating system are housed in a case only 21 inches wide by 22½ inches long and at an average depth of 9¾ inches. This casing is insulated, thus protecting the pump and all of the valves and allowing them to be heated by the exhaust from the truck motor.

What? Paint for Washington Monument?

Cleaning and repairing the Washington Monument, the 555-foot shaft of glistening white marble that for nearly half a century has been one of the famous landmarks of the National Capitol, would not at first thought seem to require much paint but according to C. L. Forgy, Sales Manager of Berry Brothers, Detroit, an order for Linoil was received by that company from the contractor who is erecting the steel scaffolding. This material is to be used for preventing the rusting of the 50,000 bolts and 50,000 nuts used in assembling the gigantic scaffold which encircles the shaft on this \$100,000 PWA job. Without effective rust protection the taking down of a temporary steel structure after the completion of a job, contractors have learned, is often seriously handicapped by the time lost in trying to turn badly rusted bolts and nuts and in cutting those that refuse to yield to wrenches.

New Automotive Chief of International Harvester

In recognition of his conspicuous achievements as chief engineer in charge of motor truck engineering for the International Harvester Co. of America, Inc., Chicago, Ill., since 1927, A. W. Scarratt has just been advanced to the position of chief engineer in charge of all the company's automotive engineering activities. Besides supervising engineering developments of motor trucks

as heretofore, Mr. Scarratt will have charge of similar work on McCormick-Deering tractors and stationary and portable power plants.

W. D. Reese, who recently joined the International Harvester organization as Mr. Scarratt's assistant, succeeds him as chief engineer of motor truck engineering.

Road Builders' Convention
Washington, D. C.
January 22-25, 1935

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A Four-Year Record of Employment

(Continued from page 13)

on Federal construction was 234,147 men, which was nearly twice the average of the preceding year and three times that of 1932.

All Federal and State work, including the maintenance work carried on exclusively by the States, is shown by the table to have employed an average of 430,385 men throughout the first ten months of 1934.

It should be explained that these figures represent direct employment on the roads only and do not include indirect employment provided in the production and transportation of materials and equipment used in the construction work. This indirect employment is estimated at 1.4 times the direct. It is probable, therefore, that the indirect employment generated by the whole Federal and State program during the first ten months of 1934 averaged not far from 600,000 men.

It should also be stated that the figures reported represent continuous employment and not numbers of individual workers employed. A study of the payrolls indicates that the number of individuals given work in any month averages about four-tenths greater than the man-months of continuous employment.

More Men on Federal Work

Comparison of the employment furnished by Federal and Federal-Aid construction with independent State construction and maintenance, as shown in Table 1, indicates that the Federal work has employed a steadily increasing number of the men supplied with highway work during the last four years.

Part of the increase in number of men employed on the Federal work has been due, since the latter part of 1932, to the limitation of hours of work that has been enforced, and the same is true with respect to State construction work done under the codes in 1934. Presumably the State maintenance work has been little affected.

On Federal construction, working time averaged 179 hours per month in 1931, dropped to 153 in 1932, to 106 in 1933 and in 1934 has averaged only 92 hours per month. On State construction, average working time remained at approximately 180 hours per month until 1934 when, as a result of the code requirements, it dropped to about 140 hours per month.

In view of these changing hours of work a more exact picture of the volume of work done on highways from year to year is afforded by a conversion of the actual employment figures into equivalent employment on the uniform basis of 180 hours per month, which was the approximate rule in 1931. This is done in Table 2.

NIRA Helped

It will be seen from this table that employment under the appropriations of the National Industrial Recovery Act was responsible in 1934 for a considerable increase in the total employment, and that the Federal employment in that year reached 39 per cent of the total.

The most striking trend indicated by the figures is the drop in employment on independent State construction. In this connection it is to be noted that the decline in State contribution to construction has been even greater than these employment figures would suggest, on account of the fact that in 1931 the States bore the expense of a considerable portion of the employment attributed to Federal and Federal-Aid work whereas in the succeeding years they have contributed in progressively smaller percentage.

State Support Lags

The transfer of State support from construction to maintenance work as Federal funds have been supplied to carry the construction cost is also one of the notable indications of this employment record. But the salient point is the evidence that the additional provision made for highways during the period by the Federal Government has been offset by withdrawal of support by the States.

It is important that these facts be generally understood at this time because the Federal Government has given notice in the Hayden-Cartwright Act of its intention hereafter to return to the Federal-Aid plan of contribution to road work. That plan will substitute for the direct grants of the recent past, a shared expenditure, which will impose upon the States an equal obligation. The contemplated Federal contribution will be considerably less than those of the past year or two. Therefore, if a material reduction of the highway program is to be avoided, it will be necessary that the States return to the work at least the measure of support they have recently withdrawn from it.

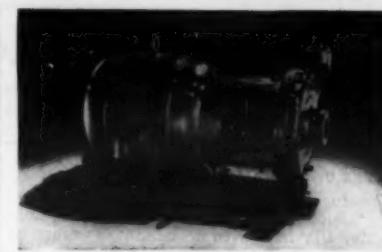
In the light of the figures presented in the employment tables, the wisdom of the provision of the Hayden-Cartwright Act which seeks to halt further diversion of motor vehicle revenues from road work is quite apparent.

Throughout the depression road work has been proved to be an effective means of combatting the menace of unemployment. As indicated herein, its benefits have extended directly and indirectly in 1934 to not less than 1,500,000 workers. It not only reaches large numbers of individuals, however, but also distributes its benefits widely throughout the nation. In the recent Federal work it has been required that at least one construction project be provided in not less than 75 per cent of the counties of each State, and the actual performance has exceeded the requirement, for work has been done in 86 percent of the counties of the United States. And, finally,

the work on the roads has the further merit of producing permanent and needed additions to the capital plant of the nation in a form that carries no threat of present over-production of consumption goods and yet supplies transportation facilities that will be imperatively needed in the future.

Built-Together Motor-Pump Requires Minimum of Space

To conserve space, to facilitate installation, to reduce weight and to reduce maintenance, a built-together motor-pump unit has been announced by Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. The unit consists of a centrifugal side-suction pump with a closed bronze impeller mounted direct-



The New Fairbanks-Morse Built-Together Motor-Pump

ly on the shaft of a ball-bearing splash-proof motor. There is no flexible coupling and consequently no alignment problem. The shaft runs in two ball bearings which require lubrication only once or twice a year. These units are available in capacities from 10 to 250 gpm and for heads up to 190 feet with motors rated from $\frac{3}{4}$ hp to 10 hp.

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Details of Diesel Tractors

277 In a booklet, "Big Little Things Make Superiority" the Caterpillar Tractor Co., Peoria, Ill., has given a wealth of information on how it has strived to improve the many little things in Caterpillar diesel tractors to give the most value per dollar of purchase price.

New 1½-Ton High-Speed Truck

278 Four Wheel Drive Auto Co., Clintonville, Wis., will be glad to send to interested contractors and highway officials complete information on the new Model HS 1½-ton high speed truck, features of which are speed, sturdiness, ease of steering, smoothness of riding, reliability, and safety on the road.

For Smooth Pavements

279 Complete information on the Hill surfacer for removing the bumps in concrete and bituminous pavements and the Hill surface tester, designed to eliminate errors in checking surface irregularities, may be secured by interested contractors and highway engineers from the H & H Manufacturing Co., Elyria, Ohio.

A Handy Trailer and Mixer

280 The J. B. Foote Foundry Co., Fredericktown, Ohio, will be glad to send to those interested complete specifications for its handy 3½-cubic foot trailer mixer, which may be loaded or discharged from either side, is easily and quickly moved from one job to another because of its rubber-tired steel wheels, and is powered by a reliable 1½-hp gasoline engine.

Expansion Joint Manual for Engineers

281 American Concrete Expansion Joint Co., 221 No. La Salle St., Chicago, Ill., has prepared a manual for highway engineers which it is distributing to better acquaint both engineers and contractors with the fundamentals of expansion and contraction joint design and the part played by Ace joints in producing better concrete highways.

New Model 35 Tractor

282 Improved design providing greater riding comfort, greater steering ease, smoother operation and longer life features the new Model 35 Bates Steel Mule announced by the Bates Mfg. Co., Joliet, Ill., which is described in literature which may be secured from the manufacturer.

A New 6-Cylinder Gas Engine

283 Model JXD, the fourth of the JX series of gas engines made by Hercules Motors Corp., Canton, Ohio, and developing 83.8 hp at 2,800 rpm with a maximum torque of 204 foot-pounds at 1,000 rpm, is described in literature which may be secured direct from the manufacturer.

New Treatment for Concrete Surfaces

284 Complete information on the new Stonhard surface treatment for concrete floors, which is claimed to increase the wear resistance of floors so treated 162.5 per cent, may be secured by those interested from the Stonhard Co., 401 No. Broad St., Philadelphia, Pa.

A Built-Together Motor-Pump

285 In Bulletin No. 5550 Fairbanks, Morse & Co., 900 So. Wabash Ave., Chicago, Ill., describes the new F-M built-together motor-pump which conserves space, facilitates installation, requires no foundation, reduces weight and maintenance. It is a side-suction pump with a splash-proof motor and available in sizes from 10 to 250 gpm.

1935 Office Calendar

286 Allis-Chalmers Mfg. Co., Milwaukee, Wis., will be pleased to send a copy of its 1935 office calendar to readers of this magazine if they will write direct to Hugh H. Honnen, Sales Promotion Dept., Tractor Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

New Dragline Has Low Ground Pressure

287 The outstanding features of the new P & H Model 750-LC dragline, designed primarily for work on irrigation and drainage projects where soft ground is met, include extra large crawlers. Full details may be secured from the Harnischfeger Corp., 38th & National Ave., Milwaukee, Wis.

Two-Stage Compressors

288 Schramm, Inc., of West Chester, Pa., will be pleased to send its Bulletin 3501 CY, describing the new two-stage compressors in which many parts are interchangeable with the single-stage compressor, to all interested.

A Calculator for Tire Equipment

289 A unique calculator for tire equipment on 1½-ton trucks has just been designed and published by The B. F. Goodrich Co., Akron, Ohio, in conjunction with its 1934 edition of "A Practical Guide for Tire Combinations on 1½-Ton Trucks." With the tire calculator it is a simple matter for any truck operator to determine the tire combination necessary to carry a given load on a truck in the 1½-ton classification. Both the tire calculator and the guide are now available upon request direct to the manufacturer or to this magazine.

Facts About Wellpoints

290 Facts about the Griffin Jet 'N Drive wellpoint, which is of special design to penetrate gravel and hard subsoils, and the Worthington special wellpoint pump which furnishes the power for the Griffin wellpoint system, may be secured by contractors having dewatering problems to solve from the Griffin Wellpoint Corp., 60 East 42nd St., New York City.

A New 1¾-Yard Excavator

291 The new 1¾-cubic yard power excavator, or known as the Osgood Chief which has recently been brought out by the Osgood Co., Marion, Ohio, is described in a leaflet which may be secured from the manufacturer.

Motor-Generator-Type Welder

292 The Lincoln Electric Co., Cleveland, Ohio, has brought out an alternating current welder known as the Lincoln Shield Arc AC, which is of new design and of the motor-generator type which takes 2 or 3-phase alternating current of standard voltages and converts it into alternating current of lower voltage most suitable for arc welding. Complete details on this new welder may be secured from the manufacturer.

One-Man Maintainer for Tractors

293 The Western No. 5 planer, a large one-man road maintenance unit for use behind any tractor of 20-hp or greater and which has a maximum cutting width of 12 feet, carries 46 feet of blades and can take material from either side, is described in Bulletin W-31-G which may be secured from the Austin-Western Road Machinery Co., Aurora, Ill.

A New Diesel Engine Catalog

294 Ingersoll-Rand Co., 11 Broadway, New York City, has recently issued a catalog on its 4-cycle single-acting solid-injection type stationary diesel engine, built in sizes ranging from 175 to 1,500 bhp and applicable for direct-connected alternating-current generator drive, gearing to pumps, direct connection to compressors, for belting to line shafting and for similar work.

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The 3,200-mile highway connecting the southern boundary of the United States with the Panama Canal Zone and transversing Mexico and Central America is approximately 40 per cent complete and open to year-round traffic with an additional 27 per cent in good condition in dry weather. The termini of the Inter-American highway are Nuevo Laredo in Mexico, just across the Rio Grande from Laredo, Texas, and Panama City, Republic of Panama. Between them, the completed road will stretch about 3,250 miles, amid the contrasts of thriving cities and tranquil native villages, of volcanic peaks and tropical jungles. While the report, Senate Document No. 224, 73d Congress, prepared by the U. S. Bureau of Public Roads, describes the highway as "proposed," it is in fact already well on the way to realization. To establish connections between the sections of road already built and to modernize existing highways where necessary is the task confronting the five Central American republics, Panama, and Mexico.

Estimates of cost to complete the road through Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama are made on three types of construction: 1. 18-foot surface of local materials, approximately \$30,000,000; 2. same surface, but with oil treatment, \$38,000,000; 3. 20-foot cement concrete surface, \$101,000,000. The completion of the Mexican section to the Guatemala border would add 80 per cent, 67 per cent, and 58 per cent respectively, to these estimates, assuming the sections already improved in Mexico would be used without change in type.

The proposed route will touch every capital from Mexico City to Panama save one, Tegucigalpa, Honduras—which will be reached by a spur line. Of the estimated 6,000,000 population of the Central American Republics and Panama, 54 per cent is in provinces traversed by the route and 28 per cent in contiguous provinces. The line follows roughly the Continental Divide at elevations usually ranging from 1,500 to 4,000 feet.

The report on "The Proposed Inter-American Highway" is in quarto size, 162 pages of text, containing economic and technical prefaces and sections descriptive of the countries traversed, a wealth of statistical data, and many plan and profile maps and illustrations. It may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 70 cents a copy.

One Man Controls Tractor-Drawn Maintainer

A one-man maintenance unit for use behind any tractor from 20-hp up and consisting of a series of cutting blades which distribute the loosened material over the road surface, effectively filling all ruts and depressions, has been announced by the Austin-Western Road Machinery Co., Aurora, Ill. This Western No. 5 planer is controlled by the operator of the tractor by means of a hand wheel within easy reach and adjustable both as to height and distance from the tractor seat. This planer has an actual cutting width of 12 feet and carries 46 feet of cutting blades. There are three stationary blades on each side running to the middle of the frame, and one long adjustable blade, at the rear, that can be set at any desired angle.

For use in cases where there is plenty of loose material at one side of the road and a scarcity of available material in the middle, an auxiliary blade is fur-

nished. This blade connects one of the forward sets of blades, according to the direction the material is to be moved and the material is carried across the machine to where it is needed. The remaining blades work back and forth as before.

The drag frame is made of heavy 6-inch ship channels thoroughly braced by means of two heavy torque tubes, 5 inches in diameter. The main frame similarly is braced by two torque tubes 3½ inches in diameter which prevent the frame from weaving when the machine is operated. The machine is furnished with an Alemite high-pressure greasing system except for the gears, which run in oil.

Work All Winter

(Continued from page 6)

will be ruined. Check the water level and specific gravity regularly during cold weather operations.

Storage batteries have a natural tendency to run down when not in use and, unless they are recharged at least once a month, the plates will become sulfated and cause damage to the battery which can be repaired at no small cost. If the tractor is to be laid up for several weeks, either take the battery to a service station which will maintain it during the idle period, or see that it is recharged at least once a month. Save the battery by cranking the engine several times with the hand crank, to loosen the oil film, before using the electric starter.

Tracks

Keep the tracks and track wheels clean. Frozen tracks will stall the tractor and may cause damage to the driving mechanism. Whenever the soil is heavy or the weather cold enough to freeze, run the tractor at the end of the day's operation in high gear over dry hard ground, then thoroughly lubricate it and clean all slush and mud from the tracks and track wheel assemblies. If a high pressure water or steam supply is available it will aid in cleaning.

Starting a Cold Engine

Depending upon the size and model of the tractor, the atmospheric temperature at the time of starting and the kind of storage place in which the tractor is kept when not in use, one of the

following suggestions may be helpful in starting a cold engine and insuring quick lubrication of the bearings and cylinder walls.

a. Drain oil from crankcase at end of day's run and heat it before refilling the crankcase at the start of the next round. Be careful to keep the oil well covered in a clean container.

b. Drain and heat the cooling solution. Warning: If alcohol is used as an anti-freeze, be careful of fire or explosion due to overheating.

c. Cover the entire tractor with tarpaulin and keep a heater burning under the tarpaulin all night. Warning: Never use this method if there are any leaks in the fuel system. Keep the heater away from the engine compartment.

d. Whenever possible, keep the tractor in a heated garage or shelter. This not only aids in starting, but the operator will usually give it much better care.

e. Follow the special instructions in your operator's instruction book for starting diesel engines.

Carbon Monoxide Poisoning

Since exhaust fumes contain deadly carbon monoxide gas, do not operate an engine in a closed garage or shop. Asphyxiation may take place inside of three minutes. If necessary to run the engine indoors, see that windows and doors are wide open and that fresh air circulates freely; or, if possible, pipe the exhaust gases outside.

If a person is overcome, get him into fresh air quickly, apply the prone

pressure method of artificial respiration and call a doctor at once.

Winter Overhauling

Neglecting to make minor repairs often results in costly delays. Therefore, when the working season is over, arrange with your tractor distributor for a thorough service inspection of the entire tractor and have the necessary work done during the idle season when it can be taken care of with the least expense and without loss of time.

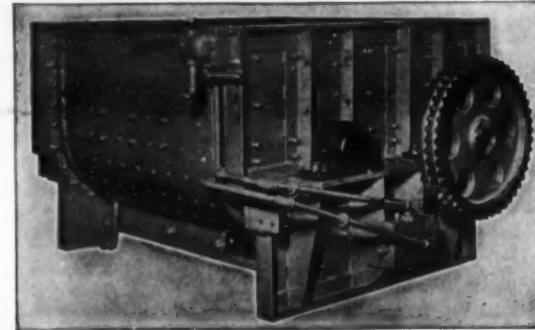
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On Chas. Weaver's job near Crystal Springs, Miss., Le Tourneau 12 yard Super Carryall Scrapers were placing 300 yds. an hour over a 1000 ft. round trip haul. Rains and tough under-foot conditions slowed the job up but little. A few difficult passes over the worst spots and away they went at top speed—and record yardage.

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STOCKTON, CAL.

New Model 35 Tractors Ride Easier, Have 43 HP

Improved design providing greater riding comfort, greater steering ease, smoother operation and longer life are features of the new Model 35 Bates Steel Mule announced by the Bates Mfg. Co., Joliet, Ill. The rear end engine vibration is eliminated by a unique design for the main engine clutch and transmission. This clutch contains a supporting feature in which the weight of the clutch parts is supported midway of two bearings. The transmission gear shaft extending from the clutch is supported on two bearings, and a gear-type coupling is incorporated between the clutch shaft and transmission shaft to give the necessary flexibility between these two members.

The crawler housing supporting the track idlers has been extended to give greater protection to the drive sprocket. The wide track rail has been retained and, through the installation of a specially-designed electric furnace of the continuous type, uniform heat treating of the track shoes has been made possible. Greater clearance has been introduced between the truck wheel flanges and track rails, assuring longer wear before flange replacement is necessary.

The braking pressure of the steering brakes has been increased so that the crawler can be stopped with a relatively light pressure of the foot. The standard Bates brake lock is mounted on the left-hand brake pedal, permitting the tractor and its load to be held stationary on any hill position by merely flexing the foot downward.

The new Bates Model 35 tractor has a drawbar pull of slightly over 43 hp and either diesel, oil or gasoline power.

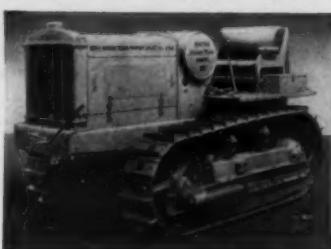
Wide Dragline Crawlers For Work on Soft Ground

Low ground pressure is the outstanding feature of the new Model 750-LC dragline, announced by Harnischfeger Sales Corp., 38th & National Ave., Milwaukee, Wis., and designed primarily for work on irrigation and drainage jobs where soft ground is encountered. The constant manipulation of mats commonly required to provide solid footing takes time and costs money by cutting heavily into the day's yardage. This new P & H machine is equipped with "mud shoes." The length of the crawler has been increased to 15 feet 9 1/4 inches with crawler shoes 42 inches wide, resulting in a reduction of ground pressure to only 7.3 pounds per square inch.

The exceptionally long corduroy crawlers are securely mounted on heavy through axles. Traction is provided through a simplified chain drive with fully machined gears enclosed to protect them from dirt and obstructions. In other respects, the new machine conforms to standard P & H design.

Largest Suction Hose Built for Dredging

A 15-foot 1-inch suction hose which is believed to be the largest piece of hose of this type ever manufactured was recently completed by the Republic Rubber Co., Youngstown, Ohio. The inside diameter of the hose is 27 inches and the wall thickness is 3 inches, which includes a continuous wire helix reinforcement of 15/32-inch diameter oil-tempered high carbon steel wire. In producing the wire for this piece of hose, it was necessary for the manufacturer to cast the largest billet ever made in order to produce one continuous length. The total weight of the hose and nipples was 2,810 pounds.



The New Model 35 Bates Steel Mule with Gas, Diesel or Oil Power

Contractor Buys Tractors and Two-Stage Compressor

George Verplank of Calumet Paving Co., has just completed a large state paving contract on Road 56 at Salem, Ind., buying two new Caterpillar Fifty diesel tractors for the job. He is now starting another large state highway contract at Bedford, Ind., and has purchased a large Ingersoll-Rand two-stage oil

burner compressor, and two Athey 11 to 12-yard wagons from the Indiana Equipment Co., Inc., Indianapolis, Ind.

Rubber-Tired Barrows Aid Freight Car Loading

Pneumatic tires have been a big boon to the wheelbarrow. One contractor, after completing a large project, was

loading his tools and equipment into a freight car with wheelbarrows of the old type. He discovered that it required two men, one pushing and the other pulling to get each barrow load into the car. When he discarded the steel-wheeled barrows for the pneumatic-tired barrows, made by Lansing Co., Lansing, Mich., he was surprised to find that one man could easily and quickly get the loaded barrow into the freight car.

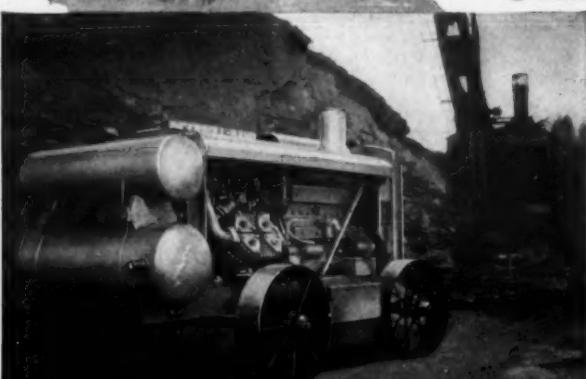
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370-foot oil-engine-driven Two-Stage, Air-Cooled Portable Compressors in use on the "Skyline Drive" in the Great Smokies.



This Two-Stage, Air-Cooled Portable Compressor and the one at the top of the page are on a road job between Washington and the Great Smokies.

Two-Stage, Air-Cooled Portable Compressors used on the new "Skyline Drive" in the Great Smokies . . .

THE "Two-Stage, Air-Cooled" operates with great economy. The oil-engine-driven unit saves as much as 65 per cent fuel cost over gasoline-engine-driven, single-stage machines of equal capacity. The gasoline-engine-driven "Two-Stage, Air-Cooled" portables make savings up to 25 per cent.

Two-staging and air-cooling keep operating temperatures down, practically eliminating carbon and other common valve troubles.

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NORTHWEST Shovels, etc.
WORTHINGTON Compressors and Tools
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ROSCOE Distributors
PIONEER Rock and Gravel Equip.
JOHNS-MANVILLE Joints, etc.
CHICAGO Automatic Conveyors
TRU-LAY Preformed Wire Rope
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STORM KING Torches
FEDERAL MOTOR Trucks

Tractor Farm Implements

Crawler Wagons, Bulldozers, etc.

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Power Operators, Elevators, Blinds, Graders, Motor Patrol Graders, Track Type Wagons
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DROTT Bulldozers, Scrappers, Eliminators HOGH-UNIVERSAL Spreaders
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LONDON CANADA Representing

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BARNES (Self-Priming) Pumps
BLACKMER Pumps
CONSOLIDATED Concrete Machinery
FOOTE Pavers
NOVO Gasoline Engines
Concrete Mixers—Tilting and Non-Tilting
Concrete Block Machines
Cement Brick Machines
Hoisting Engines
Centrifugal Diaphragm and Rotary Pumps

EVERYTHING FOR THE CONTRACTOR

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Contractors and Engineers Monthly



The Diesel Powered Grader Owned by Turner County, S.D., Which Maintained the Roads of the County Last Fall at an Average Cost of 20 Cents a mile *See page 15*

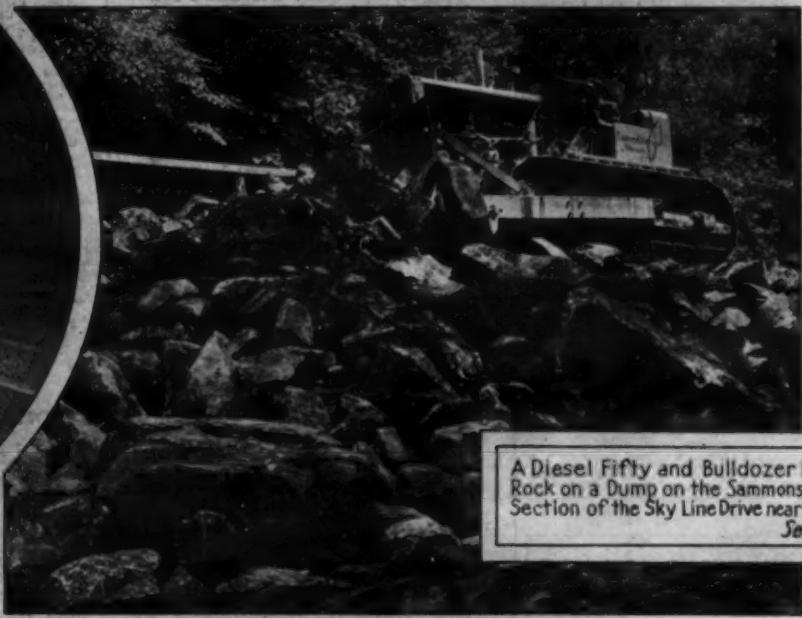


Stripping Overburden at the East Abutment of Fort Peck Dam, near Glasgow, Mont. The Bear Paw Shale was Hauled 1½ Miles to a Spoil Dump. More than 150 of the Trucks with Various Types of Body Equipment Are at Work on the Project

See also item on page 15



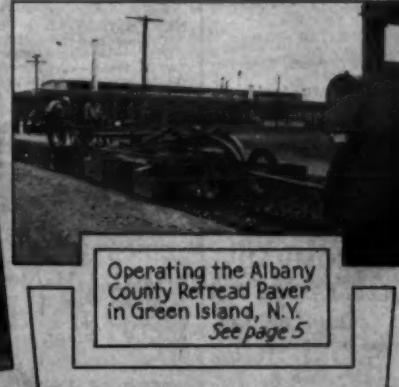
"It was Five by the Village Clock" as the First Street Car Was Driven Over the Tracks on the New Early High Strength Concrete Foundation in Brooklyn, N.Y. *See page 2*



A Diesel Fifty and Bulldozer Handling Rock on a Dump on the Sammons-Robertson Section of the Sky Line Drive near Luray, Va. *See page 1*



A Gas or Oil-Fired Mixer Heating Torch Provides Winter Concrete Insurance *See "Winter Concrete" page 9*



Operating the Albany County Retread Paver in Green Island, N.Y. *See page 5*



Excavating for Railroad Relocation at Bonneville Dam, Oregon. Orino, Bell & Malcolm, Contractors *See also item on page 24*



Opening the Top of the Truck Mixer at the Batching Plant on Perini's Cambridge-Concord, Massachusetts, Contracts *See page 8*



Loading a Crawler Wagon in Close Quarters on the Sammons-Robertson Contract on the Sky Line Drive in Virginia *See page 1*